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Final Report

Reducing Heavy Truck Aggressiveness Moving Heavy Truck into a 1987 Ford Taurus 4–Door Sedan at 91.9 kph

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16. Abstract

This report documents a crash test that was conducted for research and development in support of reducing heavy truck aggressiveness. This test was conducted with a 1987 Ford Taurus 4-door sedan, VIN 1FABP5245HG279598, at Transportation Research Center Inc. on March 14, 1995. The test vehicle was impacted on the left front of the vehicle by the heavy truck. The struck vehicle contained ten (10) accelerometers and one (1) instrumented Hybrid III driver dummy.

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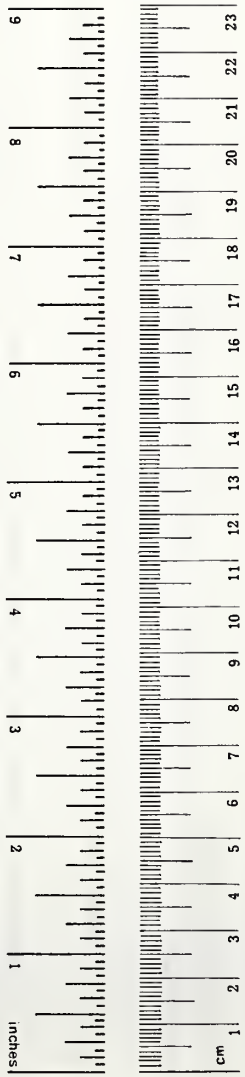
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

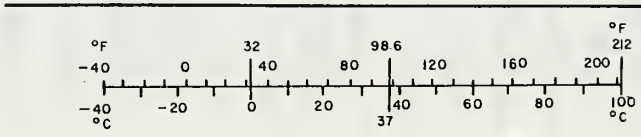
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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Section 1.0

Purpose and Test Summary

Purpose and Test Summary

This test was conducted as research in support of reducing heavy truck aggressiveness. This test was conducted on March 14, 1995.

The test vehicle, a 1987 Ford Taurus 4-door sedan, was equipped with a 3.0-liter, 6-cylinder, transverse gasoline engine and a 3-speed automatic transmission. The test weight of the vehicle was 1579 kg. The vehicle was instrumented with six (6) longitudinal axis accelerometers, three (3) lateral axis accelerometers, one (1) vertical axis accelerometer and two (2) seat belt force load cells. One (1) Part 572E dummy was seated in the left front outboard seating position according to the dummy placement procedure specified in Appendix B and Optional Appendix C of Laboratory Procedure TP-208-09. The dummy was instrumented in the head, chest, and pelvis with longitudinal, lateral, and vertical accelerometers. The dummy was also instrumented with two (2) femur load cells, and a chest deflection potentiometer.

The stationary vehicle was impacted in the left front at 0 degrees by a moving heavy truck at 91.9 kph. The intended impact engagement was the left front 50% of the car with the left front of the truck.

The moving heavy truck's test weight was 9793 kg. The truck was equipped with a standard bumper extended 16 inches forward of the standard location. The truck was instrumented with two (2) longitudinal and lateral axis accelerometers and two (2) vertical axis accelerometers.

The dummy's head injury criterion, HIC, was 872. The dummy's chest deceleration with 3 milliseconds minimum duration was 63.8 g. The dummy's maximum chest deflection was 31.4 mm. The dummy's maximum left femur force was 5856 N. The dummy's maximum right femur force was 15,025 N.

The vehicle, dummy, and heavy truck data were multiplexed and recorded on a 14-channel analog tape deck. The analog data was digitally sampled at 12,500 samples per second. The data was digitally filtered as per SAE J211 OCT88.

The test was filmed by one (1) real-time panning motion picture camera and five (5) high-speed motion picture cameras operating at approximately 1000 frames per second.

Section 2.0 contains the vehicle, dummy, truck, and test data. Appendix A contains the pre- and post-test still photographs. Appendix B contains the final test data plots. Appendix C contains dummy certification information. Appendix D contains miscellaneous test information.

Data Acquisition Explanations

The vehicle's engine bottom X-axis acceleration data channel, ENGXG2, stopped recording data after approximately 89 milliseconds because the device's cable was cut by vehicle crush.

The driver dummy's right femur force data channel, RFMF1, exceeded its device's rated full scale output at approximately 66 milliseconds.

Section 2.0

Vehicle, Dummy, Truck and Test Data

Table 1 Crash Test Summary

Test type:	Heavy Truck into Stationary Vehicle
Test date:	03/14/95
Test time:	1321
Ambient temperature:	21° C
Vehicle:	1987 Ford Taurus 4-door sedan
Vehicle test weight:	1579 kg
Impact angle:[1]	0°
Impact velocity:[2]	Primary = 91.9 kph Secondary = 91.9 kph
Maximum static crush:	257 mm
Dummies:	Driver #043
Type:	Part 572 E
Location:	Left front
Restraint:	3-point unibelt
Number of data channels:	30
Number of cameras:	
High-speed	5
Real-time	1

[1] With respect to two track centerline.
[2] Speed trap measurement (± .08 kph accuracy)

Table 2 Test Vehicle Information

Vehicle manufacturer:	Ford Motor Company
Make/model:	Ford/Taurus
VIN:	1FABP5245HG279598
Model year:	1987
Body style:	4-door sedan
Color:	Red
Engine data:	
Type:	Transverse
Cylinders:	6
Displacement:	3.0-liter
Transmission data:	_3_Speed, __Manual, _X_Automatic, _X_FWD, __RWD, __4WD
Date vehicle received:	NA
Odometer reading:	14,727
Dealer's name and address:	NA

Accessories:

Power steering	Yes	Automatic transmission	Yes
Power brakes	Yes	Automatic speed control	Yes
Power seats	No	Tilting steering wheel	Yes
Power windows	No	Telescoping steering wheel	No
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	No
Clock	No	Rear window defroster	Yes
Other	None		

Certification data from vehicle's label:

Vehicle manufactured by:		Ford Motor Company
Date of manufacture:		07/87
VIN:		1FABP5245HG279598
GVWR:		4595 lbs.
GAWR:	Front:	2507 lbs.
	Rear:	2133 lbs.

Table 2 Test Vehicle Information, Cont'd.

Tires on vehicle (mfr., line, size):	Cooper, Cobra Radial G/T, P205/70SR14
Tire pressure with maximum capacity vehicle load:	Front: 240 kPa Rear: 240 kPa
Spare tire (mfr., line, size):	None
Type of seats:	Front: Bucket Rear: Bench
Type of front seat backs:	Manually adjustable
Maximum width:	1811 mm
Wheelbase:	2682 mm

Location of "Recommended Tire Pressure" label:

The label was located on the passenger's rear door jam.

Data from vehicle's "Recommended Tire Pressure" label:

Recommended tire size:	P205/70SR14
Recommended cold tire pressure:	Front: 35 psi Rear: 35 psi
Seating capacity:	Front: 2 Rear: 3 Total: 5
Cargo load:	900 lbs.

Test vehicle attitude:

Delivered attitude:	LF	688 mm;	RF	704 mm;	LR	641 mm;	RR	654 mm
Pre-test attitude:	LF	690 mm;	RF	702 mm;	LR	582 mm;	RR	590 mm
Post-test attitude:	LF	NA[1];	RF	631 mm;	LR	560 mm;	RR	628 mm

[1] Left front fender destroyed during impact event.

Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

Right front	450	kg	Right rear	237	kg
Left front	447	kg	Left rear	246	kg
Total front weight	897	kg	(65.0% of total vehicle weight)		
Total rear weight	483	kg	(35.0% of total vehicle weight)		
Total test weight	1380	kg			
Target test weight[1]	1581	kg			

Weight of test vehicle:

Right front	456	kg	Right rear	312	kg
Left front	475	kg	Left rear	336	kg
Total front weight	931	kg	(59.0% of total vehicle weight)		
Total rear weight	648	kg	(41.0% of total vehicle weight)		
Total test weight	1579	kg			

Weight of ballast secured in vehicle cargo area:	None
Components removed to meet target test weight:	None
CG rearward of front wheel centerline:	1080 mm

[1] The target test weight was established during Test 920507.

Table 3 Truck Information

Weight Distribution:

Front: 2656 kg
Rear: 7137 kg

Axle Spacing:

Front: 3835 mm
Rear: 1308 mm

Distance of C.G. behind front axle: 3257 mm

Bumper Description: Stock truck bumper extended forward 406 mm

Truck Damage: The left portion of the bumper was pushed rearward and upward. Bumper was cracked where it is mounted to the truck frame bracket. Truck steering box was also broken.

Table 4 Post-Impact Data

Test number:	950314
Date of test:	03/14/95
Time of test:	1321
Type of test:	Heavy Truck into Stationary Vehicle
Impact angle:[1]	0°
Ambient temperature at impact area:	21° C
Temperature in occupant compartment:	21° C
Impact velocity:	
Primary	91.9 kph
Secondary	91.9 kph
Distance from heavy truck to vehicle:	
Entering trap	381 mm
Exiting trap	51 mm

Test vehicle static crush:

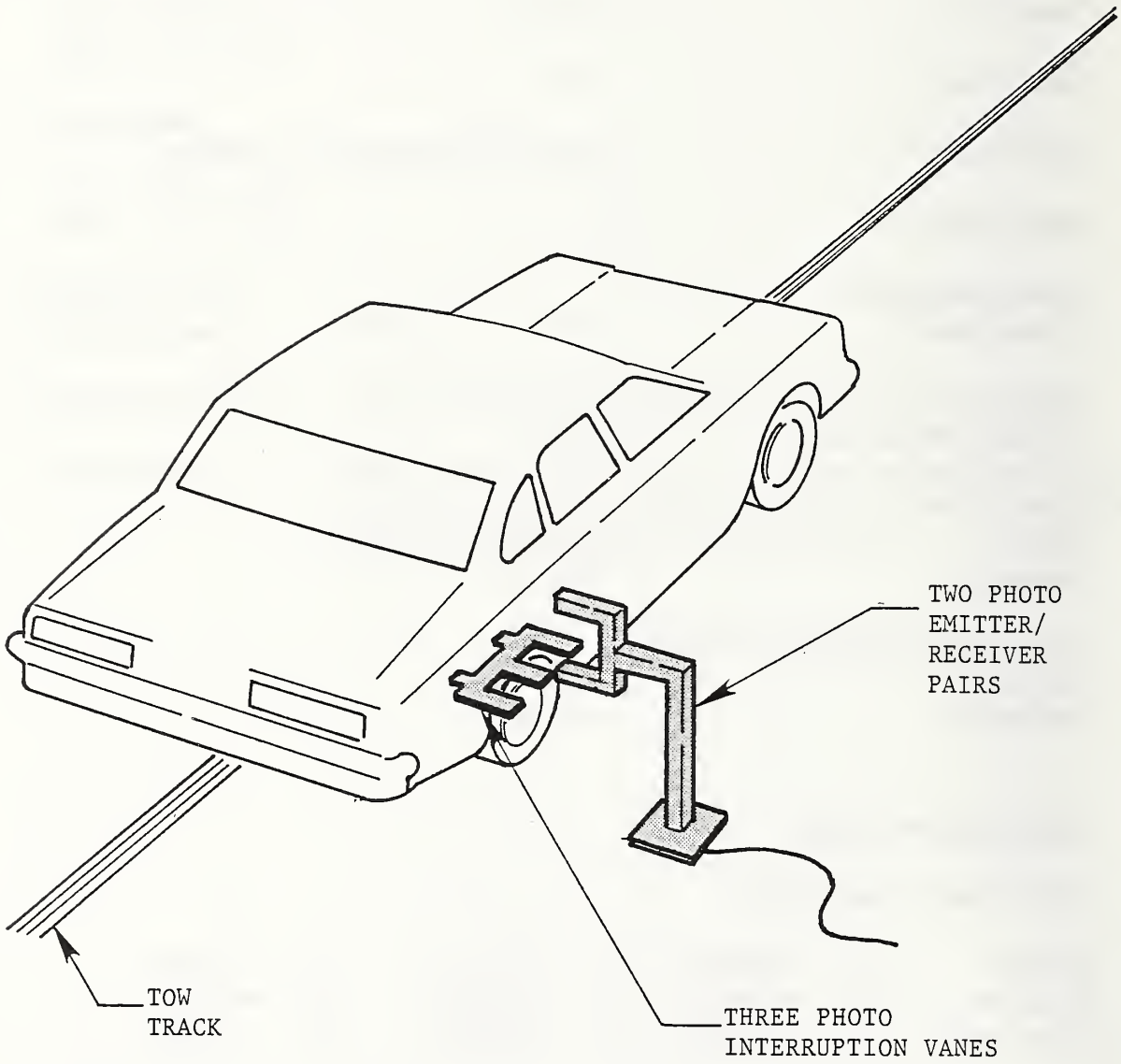
Overall length of test vehicle:

Pre-test:	L	4628 mm;	C	4775 mm;	R	4633 mm
Post-test:	L	4420 mm;	C	4518 mm;	R	4642 mm
Total crush:	L	208 mm;	C	257 mm;	R	-9 mm

Average crush: 152 mm

[1] As measured clockwise from the subject vehicle's front longitudinal centerline.

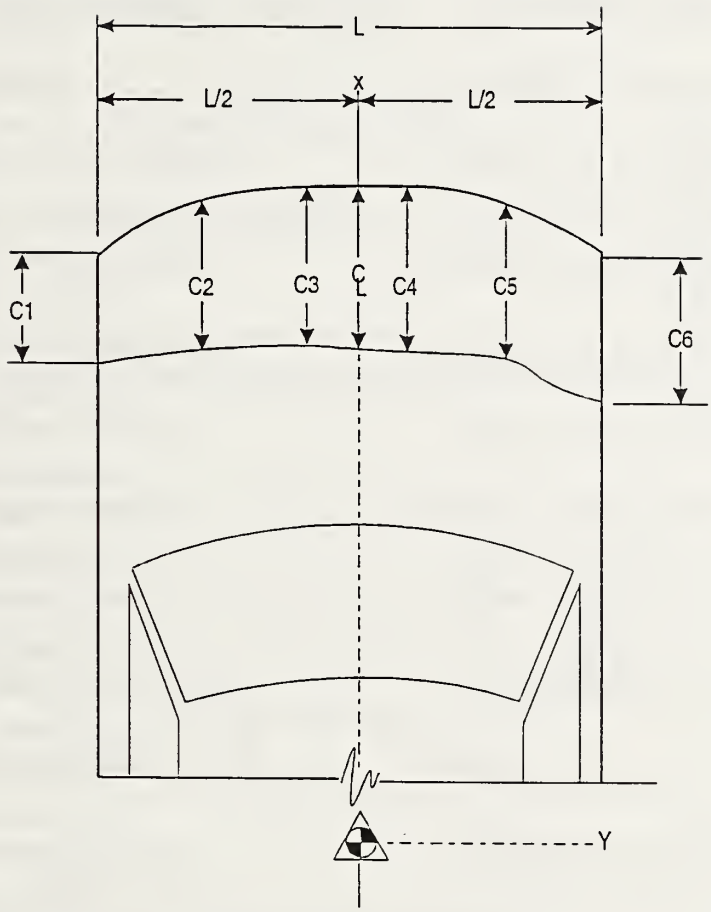
Figure 1 Impact Velocity Measurement System



The final vane clears emitter/receiver 51 millimeters before impact.

The vanes have 305-millimeter spacing.

Figure 2 Vehicle Crush



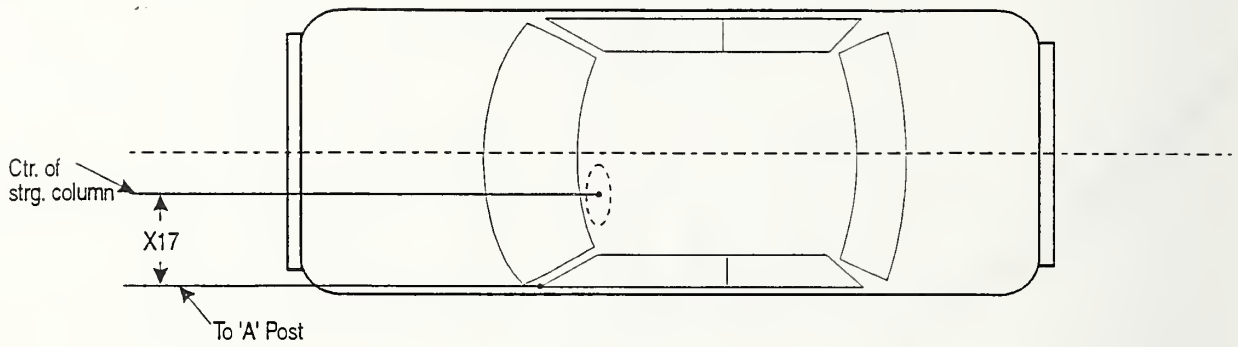
NOTES: L is pre-test length of contact surface.
C1 through C6 are spaced equally apart.
CL is vehicle centerline.

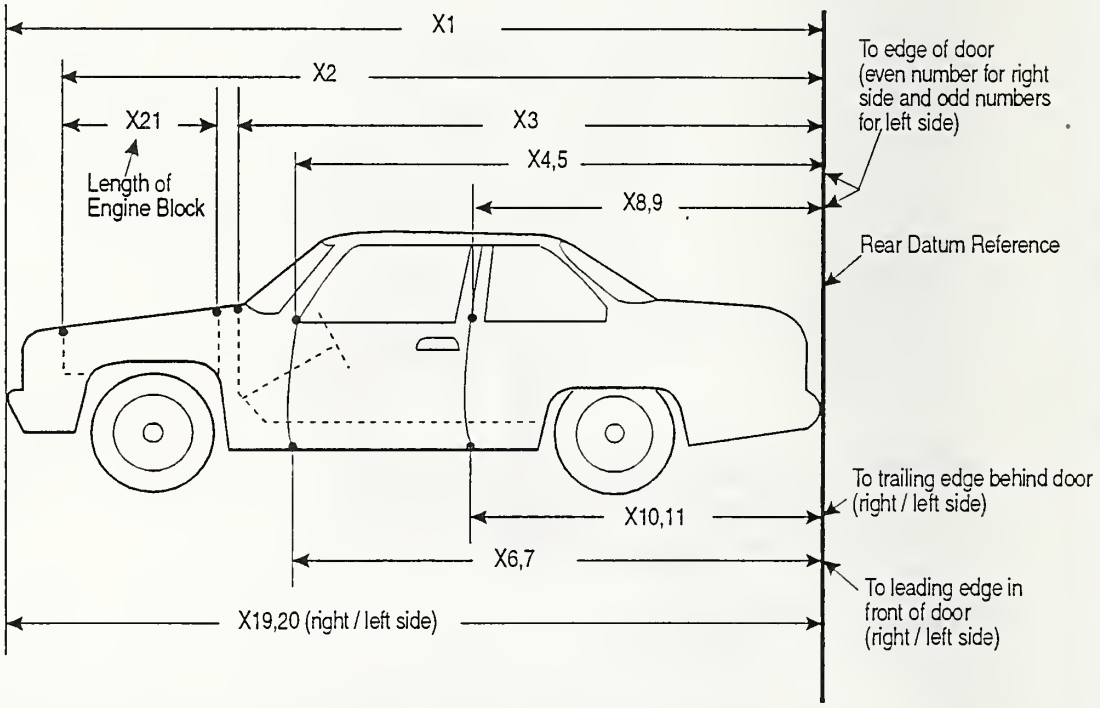
Vehicle: 1987 Ford Taurus

	Pre-test	Post-test[1]	Crush
L	1523 mm		
C1	4628 mm	4420 mm	208 mm
C2	4715 mm	4461 mm	254 mm
C3	4757 mm	4509 mm	248 mm
C4	4763 mm	4547 mm	216 mm
C5	4715 mm	4598 mm	117 mm
C6	4633 mm	4642 mm	-9 mm
CL	4775 mm	4518 mm	257 mm

[1] Post-test measurements taken to plane of front bumper mounting flanges because the front bumper was destroyed during the impact event.

Figure 3 Pre-Test and Post-Test Measurement Points





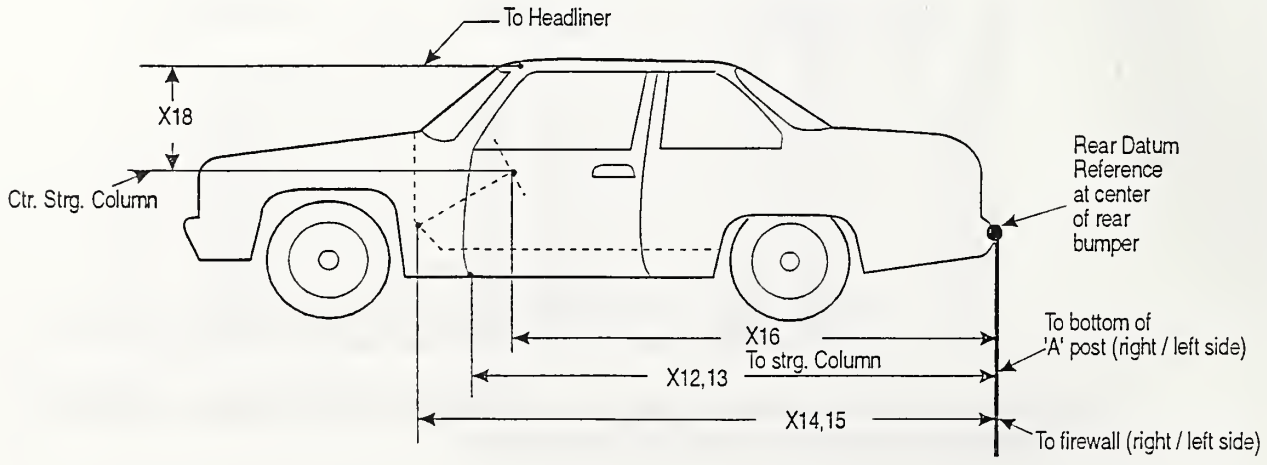
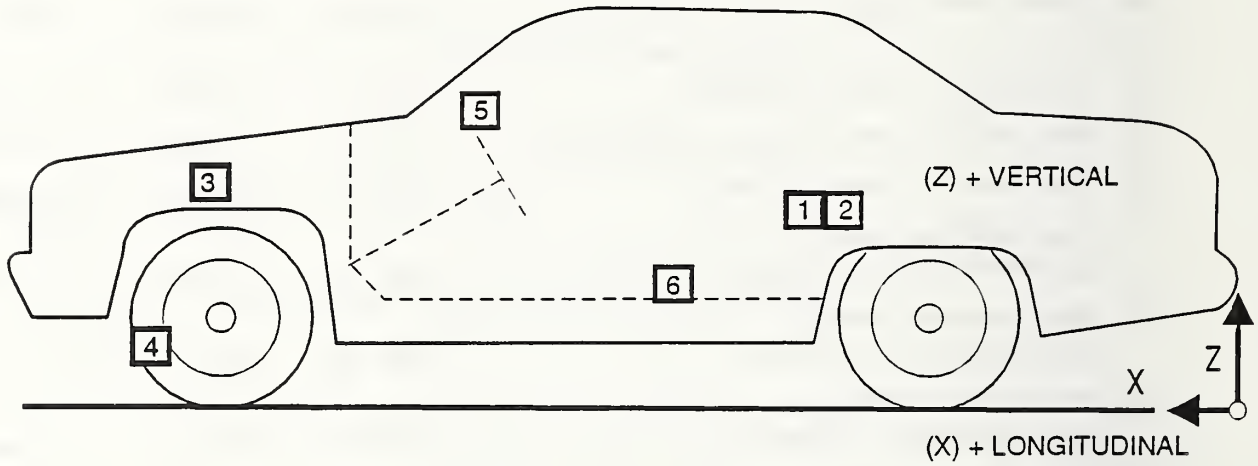


Table 5 Impacted Vehicle Measurements

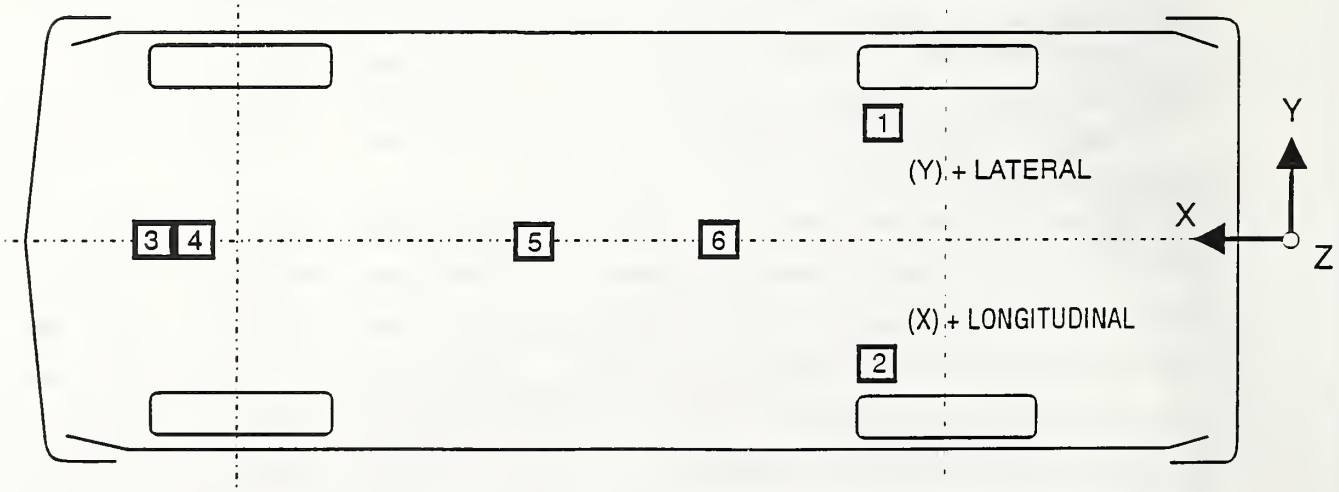
Vehicle Make/Model: Ford/Taurus Test Number: 950314

No.	Type of measurement	Pre-test	Post-test	Diff.
X1	Total length of vehicle at centerline	4775 mm	4518 mm	257 mm
X2	Rear surface of vehicle to front of engine block	4222 mm	4153 mm	69 mm
X3	Rear surface of vehicle to firewall	3594 mm	3356 mm	238 mm
X4	Rear surface of vehicle to upper leading edge of right door	3296 mm	3332 mm	-36 mm
X5	Rear surface of vehicle to upper leading edge of left door	3295 mm	NA	NA
X6	Rear surface of vehicle to lower leading edge of right door	3238 mm	3226 mm	12 mm
X7	Rear surface of vehicle to lower leading edge of left door	3238 mm	NA	NA
X8	Rear surface of vehicle to upper trailing edge of right door	2216 mm	2250 mm	-34 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2209 mm	NA	NA
X10	Rear surface of vehicle to lower trailing edge of right door	2205 mm	2200 mm	5 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2205 mm	NA	NA
X12	Rear surface of vehicle to bottom of "A" post on right side	3246 mm	3246 mm	0 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	3239 mm	NA	NA
X14	Rear surface of vehicle to firewall - right side	3544 mm	3642 mm	-98 mm
X15	Rear surface of vehicle to firewall - left side	3551 mm	3420 mm	-131 mm
X16	Rear surface of vehicle to steering wheel center	2810 mm	2562 mm	248 mm
X17	Center of steering column to "A" post	286 mm	NA	NA
X18	Center of steering column to headliner	418 mm	696 mm	-278 mm
X19	Rear surface of vehicle to right side of front bumper	4628 mm	4420 mm	208 mm
X20	Rear surface of vehicle to left side of front bumper	4633 mm	4642 mm	-9 mm
X21	Length of engine block	482 mm	482 mm	0 mm

Figure 4 Vehicle Accelerometer Placement



SIDE VIEW



BOTTOM VIEW

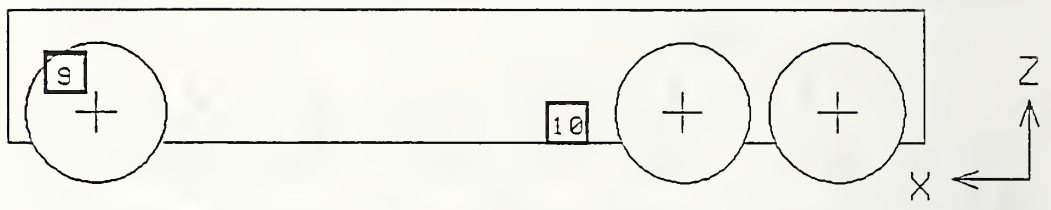
Table 6 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 950314 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 LEFT REAR SEAT CROSSMEMBER	2018 mm	687 mm	313 mm				
LONGITUDINAL				3.3 g	@ 106.4 ms	31.1 g	@ 60.3 ms
LATERAL				10.5 g	@ 133.0 ms	15.6 g	@ 67.0 ms
2 RIGHT REAR SEAT CROSSMEMBER	2024 mm	-688 mm	318 mm				
LONGITUDINAL				1.3 g	@ 305.8 ms	20.8 g	@ 56.4 ms
LATERAL				12.6 g	@ 146.5 ms	13.2 g	@ 49.2 ms
3 ENGINE TOP	4173 mm	146 mm	760 mm				
LONGITUDINAL				25.2 g	@ 71.8 ms	85.5 g	@ 55.0 ms
4 ENGINE BOTTOM	4099 mm	-20 mm	176 mm				
LONGITUDINAL[1]				1051.0 g	@ 93.1 ms	56.2 g	@ 47.7 ms
5 INSTRUMENT PANEL CENTER	3201 mm	-14 mm	952 mm				
LONGITUDINAL				43.7 g	@ 174.6 ms	78.9 g	@ 63.7 ms
6 CENTER OF GRAVITY	2636 mm	0 mm	347 mm				
LONGITUDINAL				7.6 g	@ 115.8 ms	24.4 g	@ 77.3 ms
LATERAL				14.0 g	@ 145.4 ms	15.1 g	@ 77.3 ms
VERTICAL				28.6 g	@ 67.8 ms	16.8 g	@ 49.3 ms
RESULTANT				30.9 g	@ 77.7 ms		

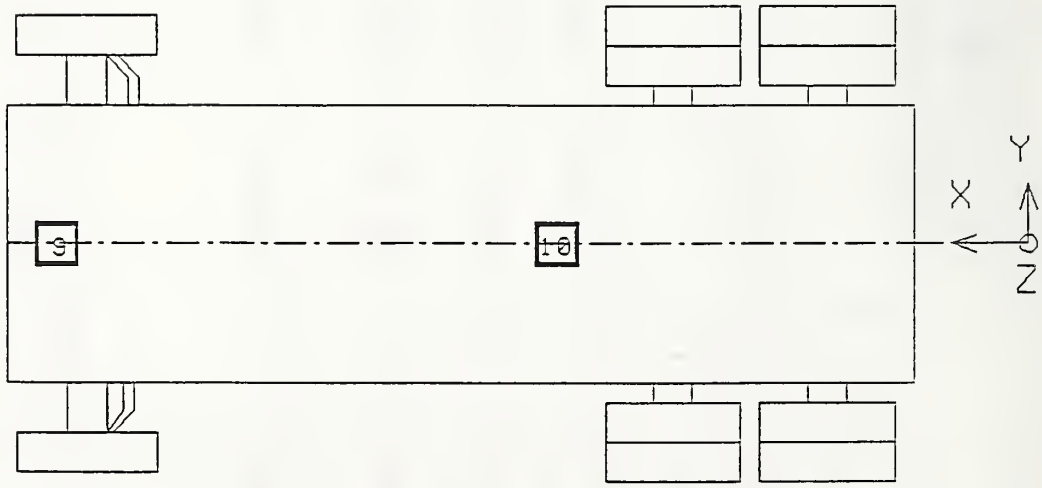
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

[1]See DATA ACQUISITION EXPLANATIONS

Figure 5 Heavy Truck Accelerometer Placement



SIDE VIEW



BOTTOM VIEW

Table 7 Heavy Truck Accelerometer locations and Data Summary

TEST NUMBER: 950314 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
9 FRONT FRAME CROSSMEMBER	6160 mm	0 mm	658 mm				
LONGITUDINAL				14.9 g	@ 85.3 ms	18.3 g	@ 78.5 ms
LATERAL				11.5 g	@ 135.1 ms	17.4 g	@ 74.2 ms
VERTICAL				25.6 g	@ 87.8 ms	9.0 g	@ 32.3 ms
RESULTANT				27.0 g	@ 87.6 ms		
10 CENTER OF GRAVITY	2527 mm	0 mm	1050 mm				
LONGITUDINAL				5.0 g	@ 92.7 ms	9.5 g	@ 73.0 ms
LATERAL				8.1 g	@ 83.5 ms	6.5 g	@ 91.8 ms
VERTICAL				5.0 g	@ 112.6 ms	4.9 g	@ 96.4 ms
RESULTANT				10.5 g	@ 73.3 ms		

REFERENCE: X: + FORWARD FROM TRAILING EDGE OF TRUCK
Y: + LEFT FROM TRUCK CENTERLINE
Z: + UP FROM GROUND LEVEL

Table 8 Dummy Data Summary

TEST NUMBER: 950314 DRIVER DUMMY SERIAL NUMBER: 043

	POSITIVE DIRECTION		NEGATIVE DIRECTION	
HEAD ACCELERATION				
LONGITUDINAL	4.9 g	@ 307.0 ms	115.2 g	@ 102.1 ms
LATERAL	8.6 g	@ 139.4 ms	77.0 g	@ 107.4 ms
VERTICAL	14.5 g	@ 68.1 ms	63.7 g	@ 99.5 ms
RESULTANT	128.1 g	@ 102.0 ms		
HIC	872 from 93.5 to 111.1			
CHEST ACCELERATION				
LONGITUDINAL	11.3 g	@ 129.4 ms	53.9 g	@ 99.0 ms
LATERAL	9.9 g	@ 221.7 ms	47.2 g	@ 98.5 ms
VERTICAL	13.4 g	@ 94.3 ms	19.4 g	@ 88.0 ms
RESULTANT	72.7 g	@ 98.6 ms		
3 MSEC	63.8			
CHEST DEFLECTION				
LONGITUDINAL	0.2 mm	@ 7.4 ms	31.4 mm	@ 89.0 ms
PELVIS ACCELERATION				
LONGITUDINAL	10.6 g	@ 123.0 ms	198.1 g	@ 66.1 ms
LATERAL	88.7 g	@ 66.1 ms	30.9 g	@ 104.6 ms
VERTICAL	68.9 g	@ 66.2 ms	64.1 g	@ 67.0 ms
RESULTANT	227.3 g	@ 66.1 ms		
FEMUR LOAD				
LEFT	176.3 N	@ 26.4 ms	5856.4 N	@ 85.7 ms
RIGHT	3329.7 N	@ 191.4 ms	15025.1 N	@ 66.2 ms

POSITIVE DIRECTION		NEGATIVE DIRECTION	
LONGITUDINAL:	FORWARD	LONGITUDINAL:	REARWARD
LATERAL:	LEFTWARD	LATERAL:	RIGHTWARD
VERTICAL:	UPWARD	VERTICAL:	DOWNWARD
FORCE:	TENSION	FORCE:	COMPRESSION

Table 9 Post-Impact Dummy/Vehicle Data

Visible Dummy Contact Points:

	Driver #043	Passenger #NA
Head	A-pillar	
Chest	Steering wheel rim	
Abdomen	None	
Left knee	Instrument panel	
Right knee	Instrument panel	

Door Opening:

	Left	Right
Front	NA, door destroyed	
Rear	Tools required	

Seat Movement:

	Seat Back Failure	Seat Shift
Front	None	
Rear	NA	

Glazing Damage: The entire windshield was cracked and the left half was broken out during the impact event. The driver's door glass was shattered during the impact event.

Other Notable Impact Effects: Left A-pillar broken at base. Left front quarter panel and door destroyed and torn away from vehicle.

Dummy Kinematic Summary

Upon impact, the driver dummy translated forward across the driver's seat and both knees impacted the lower instrument panel. The right side of the dummy's thorax impacted the steering wheel rim and the dummy's head hit the driver's side A-pillar. The dummy then came to rest sitting in the driver's seat facing forward and leaning toward the right.

Figure 6 Dummy Measurement Locations for Front Seat Occupants

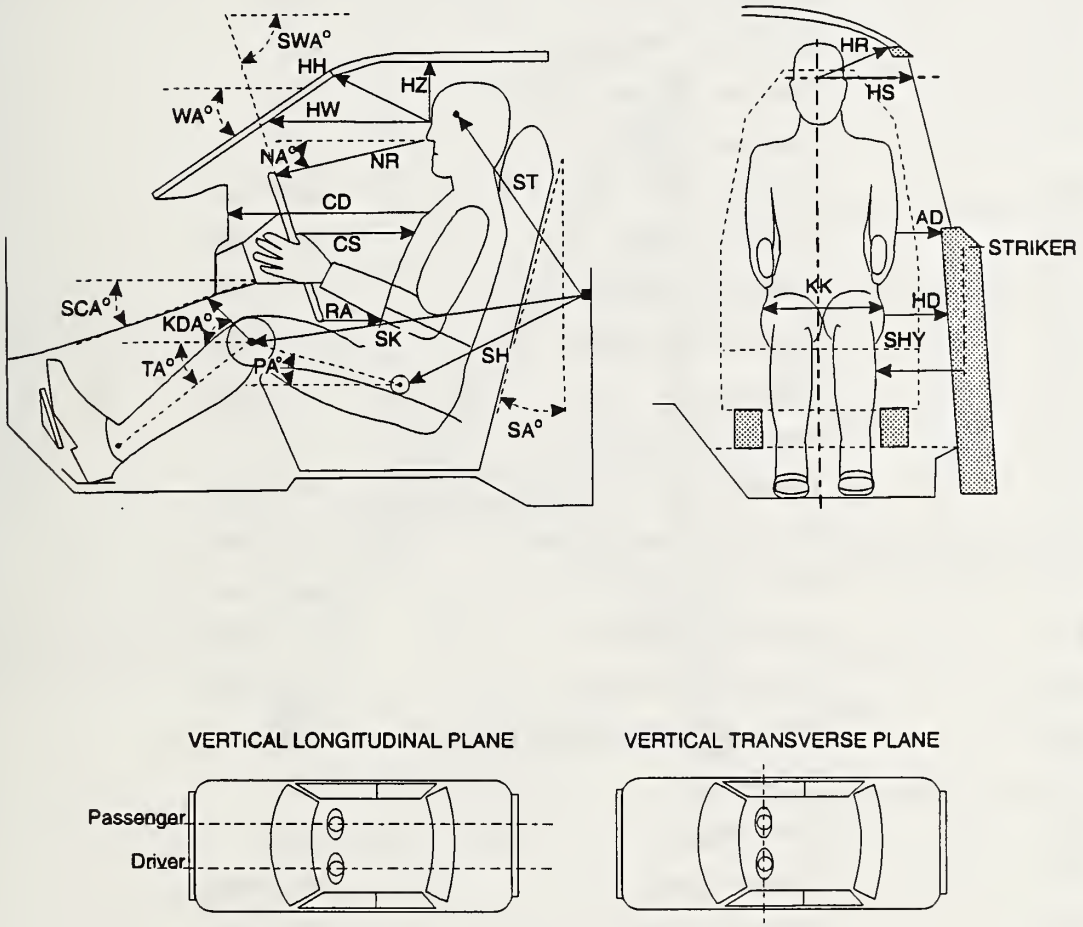


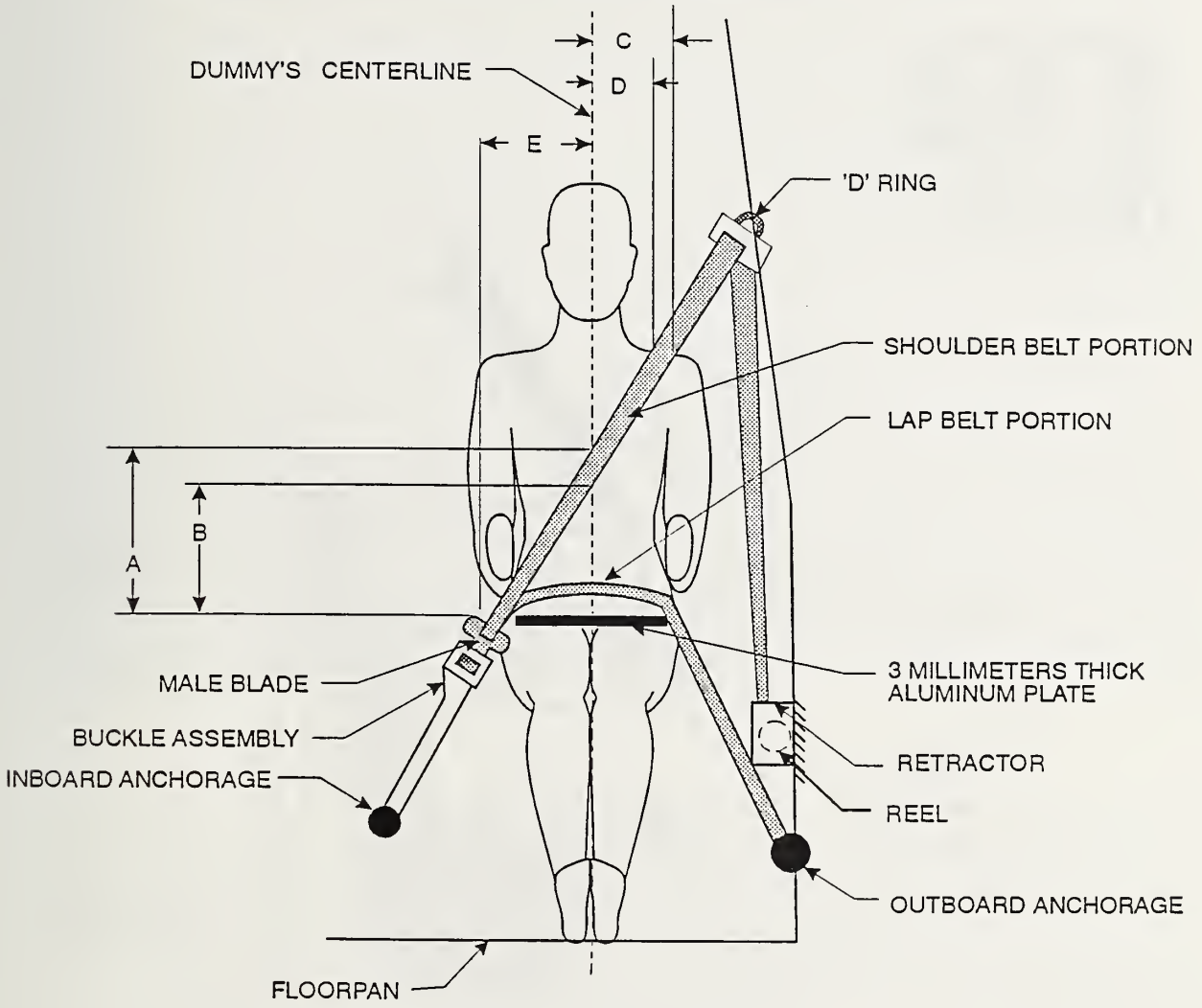
Table 10 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #043)	Passenger (Serial #NA)
WA	Windshield angle	29°	
SWA	Steering wheel angle	68°	
SCA	Steering column angle	23°	
SA	Seat back angle	23°	
HZ	Head to roof	184 mm	
HH	Head to header	363 mm	
HW	Head to windshield	568 mm	
HR	Head to side header	196 mm	
NR	Nose to rim	427 mm	
NA	Nose to rim angle	12°	
CD	Chest to dash	573 mm	
CS	Steering wheel to chest	359 mm	
RA	Rim to abdomen	226 mm	
KDL	Left knee to dash	204 mm	
KDR	Right knee to dash	211 mm	
KDA	Outboard knee to dash angle	30°	
PA	Pelvic angle	22°	
TA	Tibial angle	34°	
KK	Knee to knee	265 mm	
ST[1]	Striker to head	480 mm	
	Striker to head angle	-86°	
SK[1]	Striker to knee	578 mm	
	Striker to knee angle	10°	
SH[1]	Striker to H-point	269 mm	
	Striker to H-point angle	52°	
SHY	Striker to H-point (Y dir.)	258 mm	
HS	Head to side window	290 mm	
HD	H-point to door	170 mm	
AD	Arm to door	110 mm	

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

[1] A negative angle indicates the measurement point was located above the striker.

Figure 7 Seat Belt Positioning Data

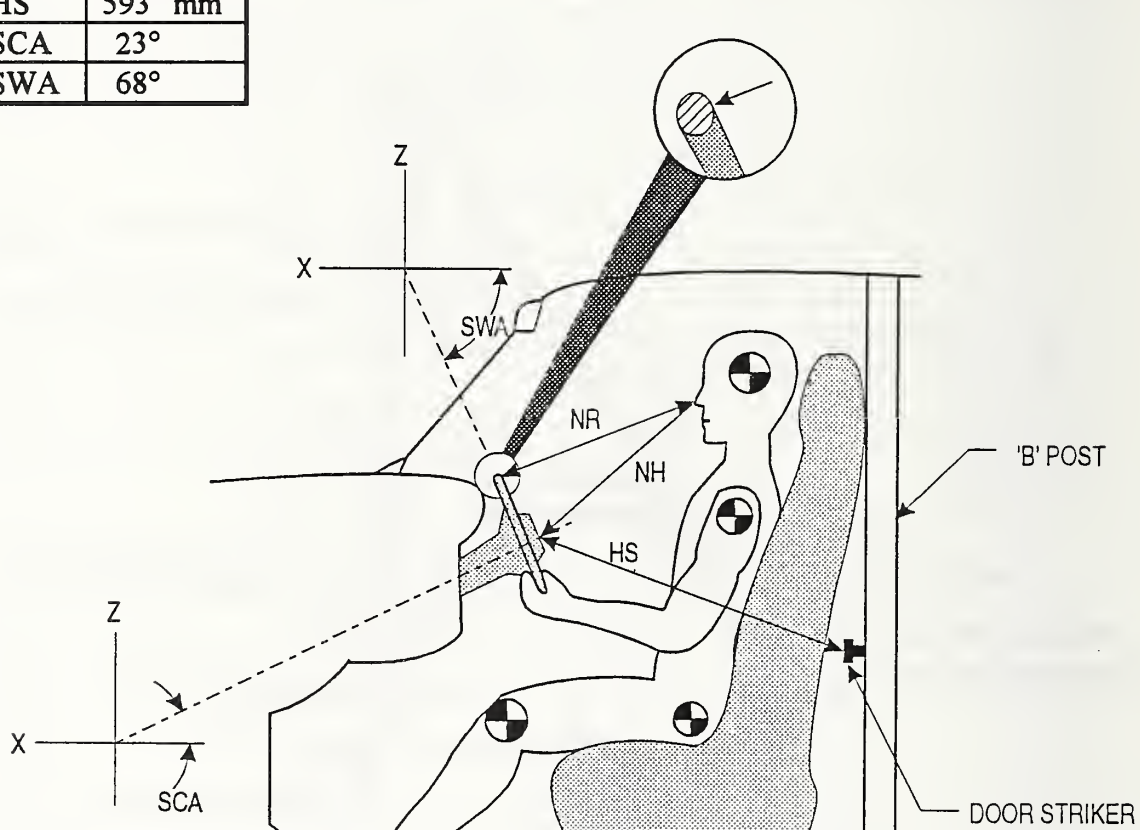


		Driver	Passenger
A	Top surface of aluminum plate to belt upper edge	388	NA
B	Top surface of aluminum plate to belt lower edge	300	NA
C	Dummy centerline to outer edge of belt at chest flesh top	108	NA
D	Dummy centerline to inner edge of belt at chest flesh top	45	NA
E	Dummy centerline to intersection of upper torso belt and lap belt	253	NA

All distance measurements are in millimeters.

Figure 8 Driver Dummy To Steering Column/Wheel Assembly Data

NR	427 mm
NH	440 mm
HS	593 mm
SCA	23°
SWA	68°



Position of steering column tilting and telescoping adjustments, if any:
The steering column was fastened in the middle of the adjustment range.

NR = Distance from tip of dummy's nose to top rear surface of steering wheel rim.
NH = Distance from tip of dummy's nose to center of steering column hub.
HS = Distance from center of steering column hub to the forward surface of the door lock striker pin.
SCA = Angle of steering column relative to horizontal.
SWA = Angle of steering wheel relative to horizontal.

Figure 9 Camera Positions

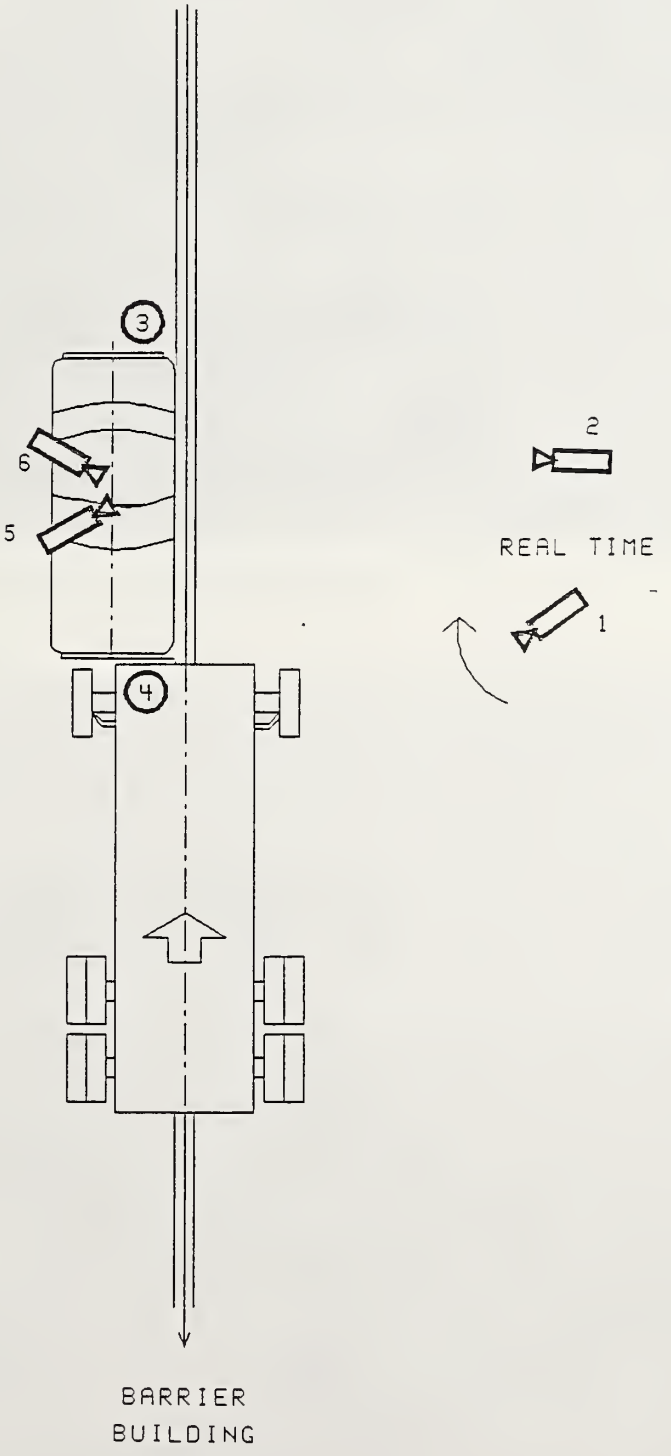


Table 11 Motion Picture Camera Information

Camera Number	Location	Type	Lens (mm)	Speed (Fps)	Purpose of Camera Data
1	Left panning	Bolex	16	24	Real-time documentation
2	Left wide	Photosonic	13	1005	Vehicle dynamics
3	Overhead wide	Photosonic	8.5	998	Vehicle dynamics
4	Onboard truck	Photosonic	8	1025	Vehicle dynamics
5	Onboard car front	Photosonic	8	1000	Dummy kinematics
6	Onboard car rear	photosonic	8	1005	Dummy kinematics

Figure A-1 Pre-Test Front View

Figure A-2 Post-Test Front - View 1

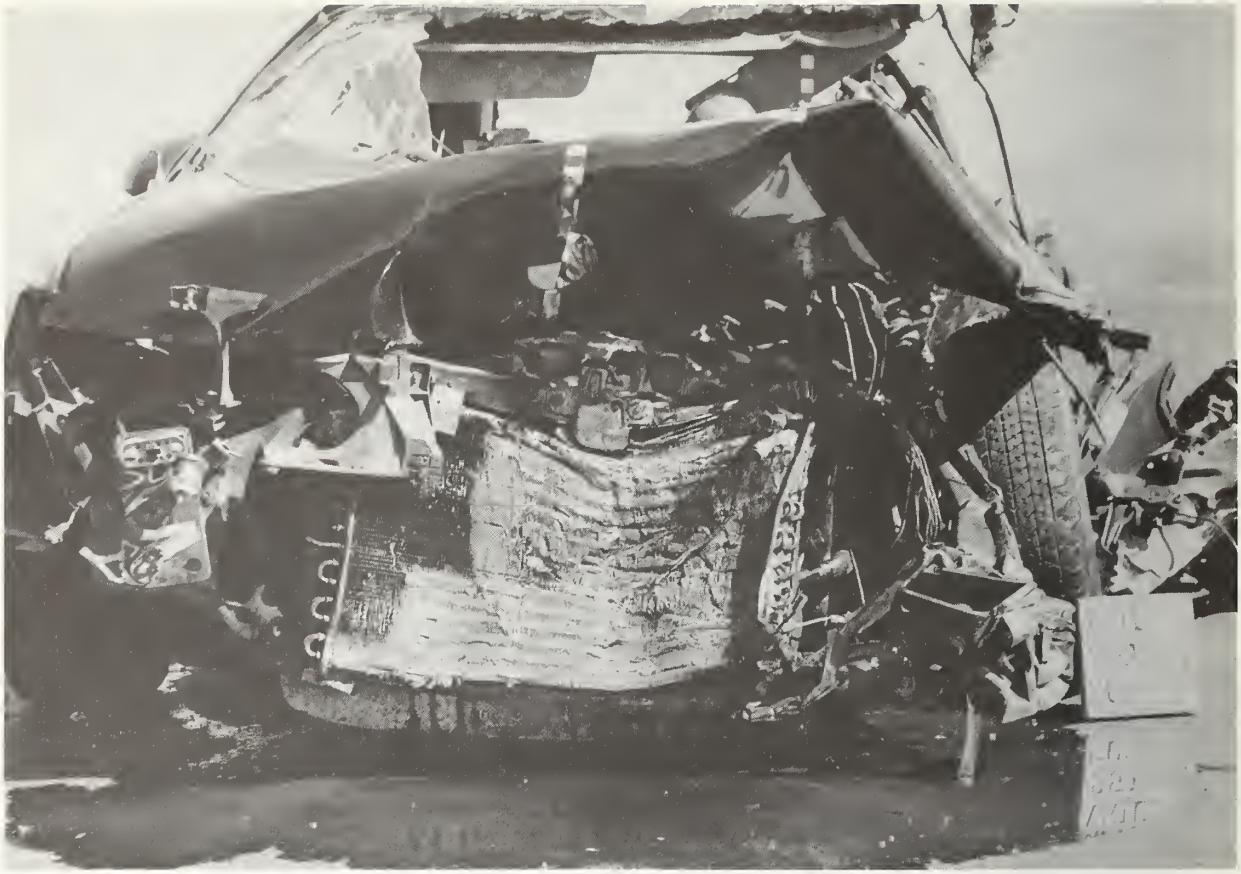


Figure A-3 Post-Test Front - View 2

Figure A-4 Post-Test Left Front Three-Quarter - View 1

Figure A-5 Post-Test Left Front Three-Quarter - View 2

Figure A-6 Post-Test Left Front Three-Quarter - View 3

Figure A-7 Pre-Test Left Side View

Figure A-8 Post-Test Left Side View

Figure A-9 Pre-Test Rear View

Figure A-10 Post-Test Rear View

Figure A-11 Pre-Test Right Side View

Figure A-12 Post-Test Right Side View

Figure A-13 Pre-Test Right Front Three-Quarter View

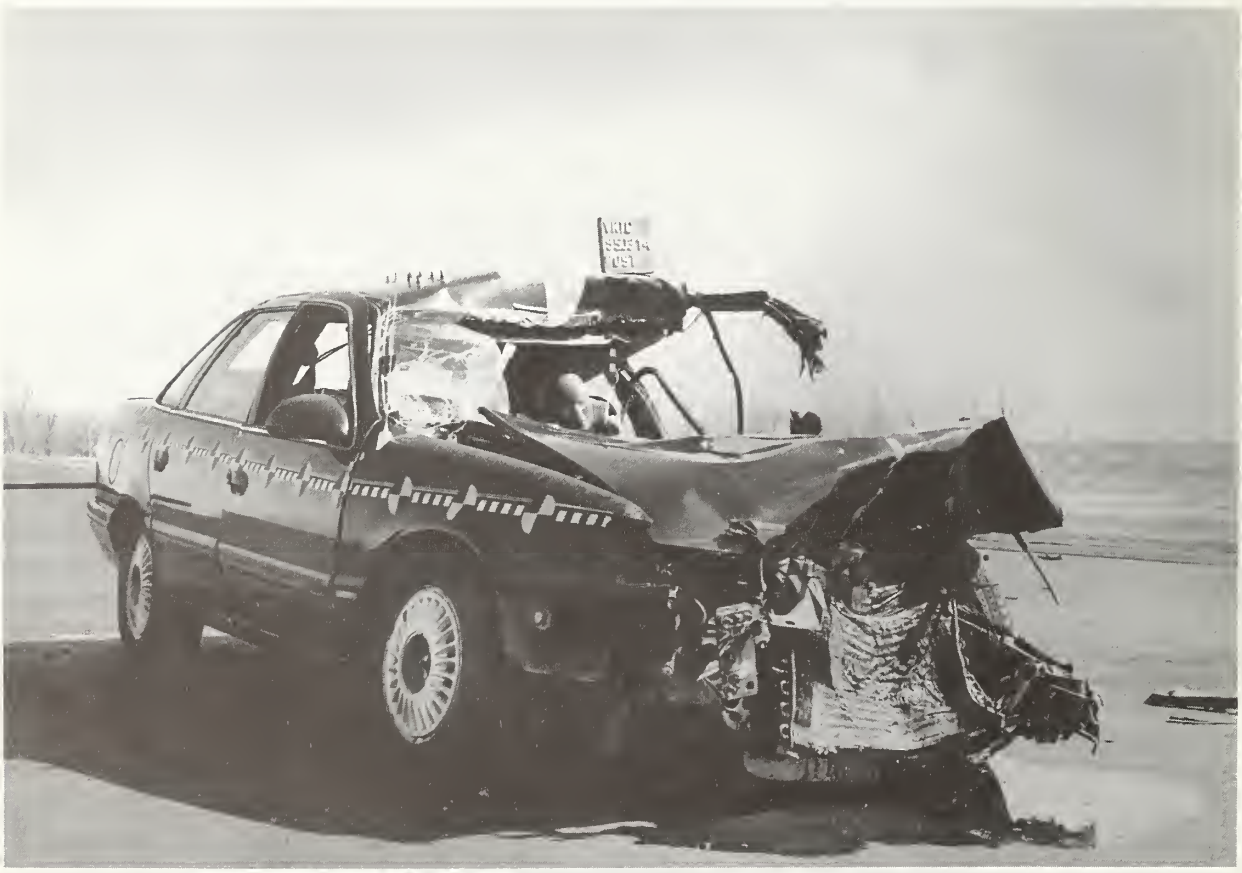


Figure A-14 Post-Test Right Front Three-Quarter View

Figure A-15 Pre-Test Engine Compartment View

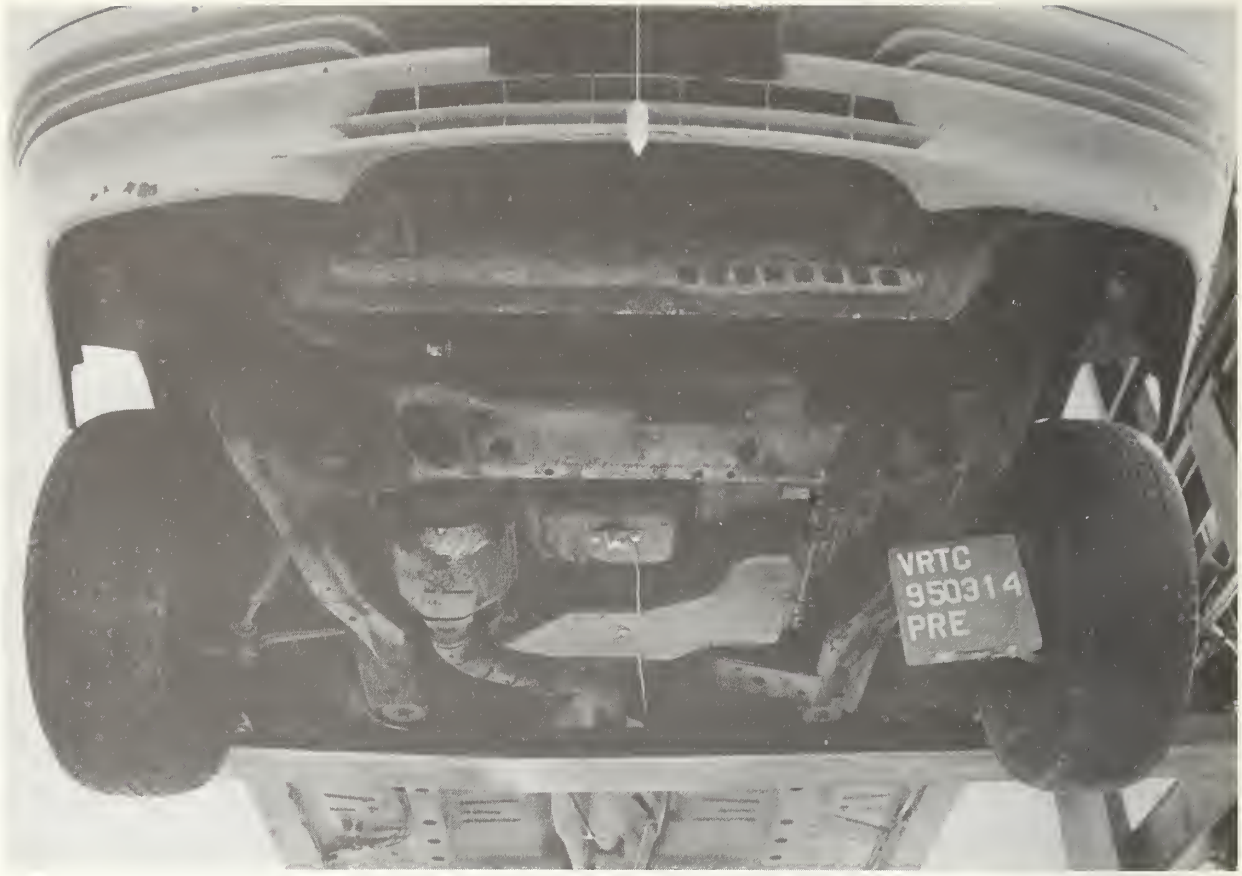


Figure A-16 Pre-Test Front Underbody View

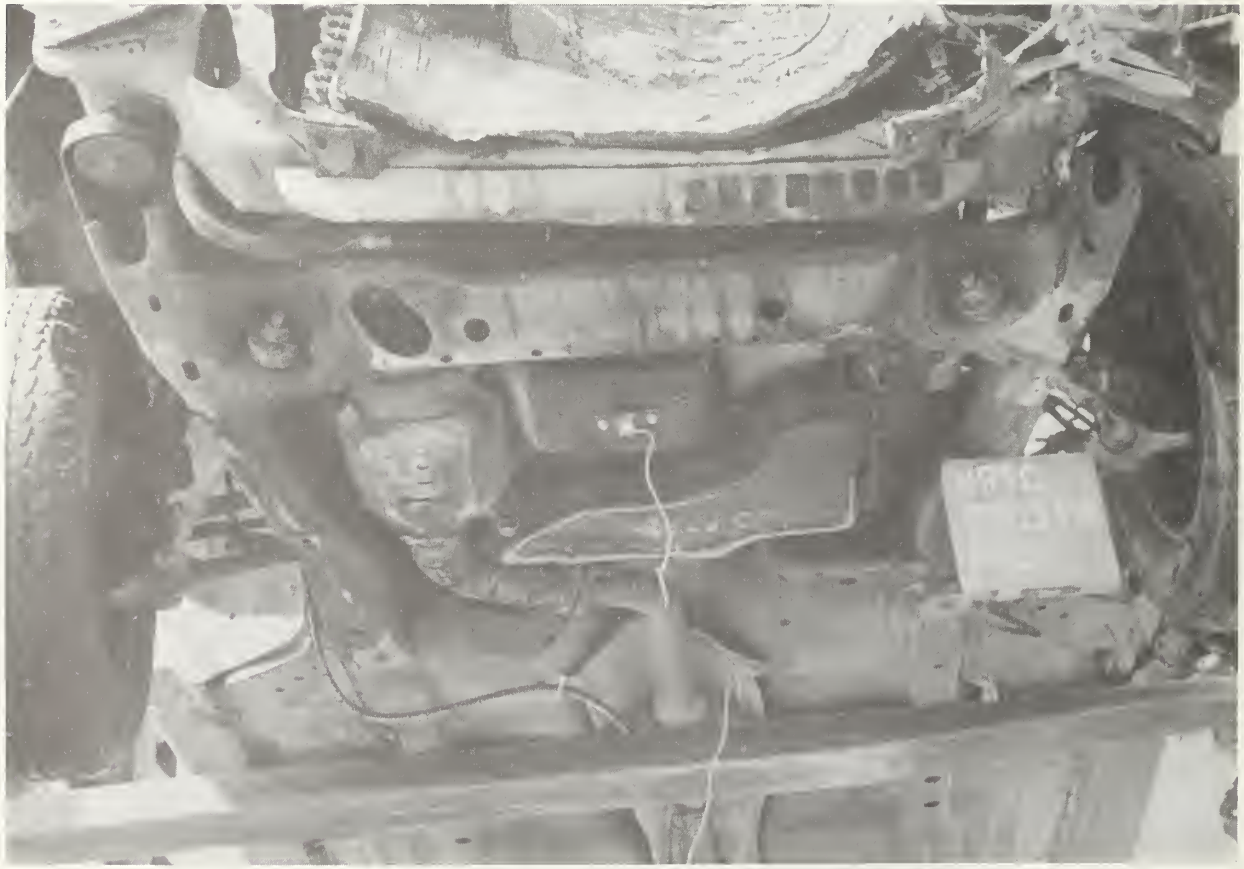


Figure A-17 Post-Test Front Underbody View

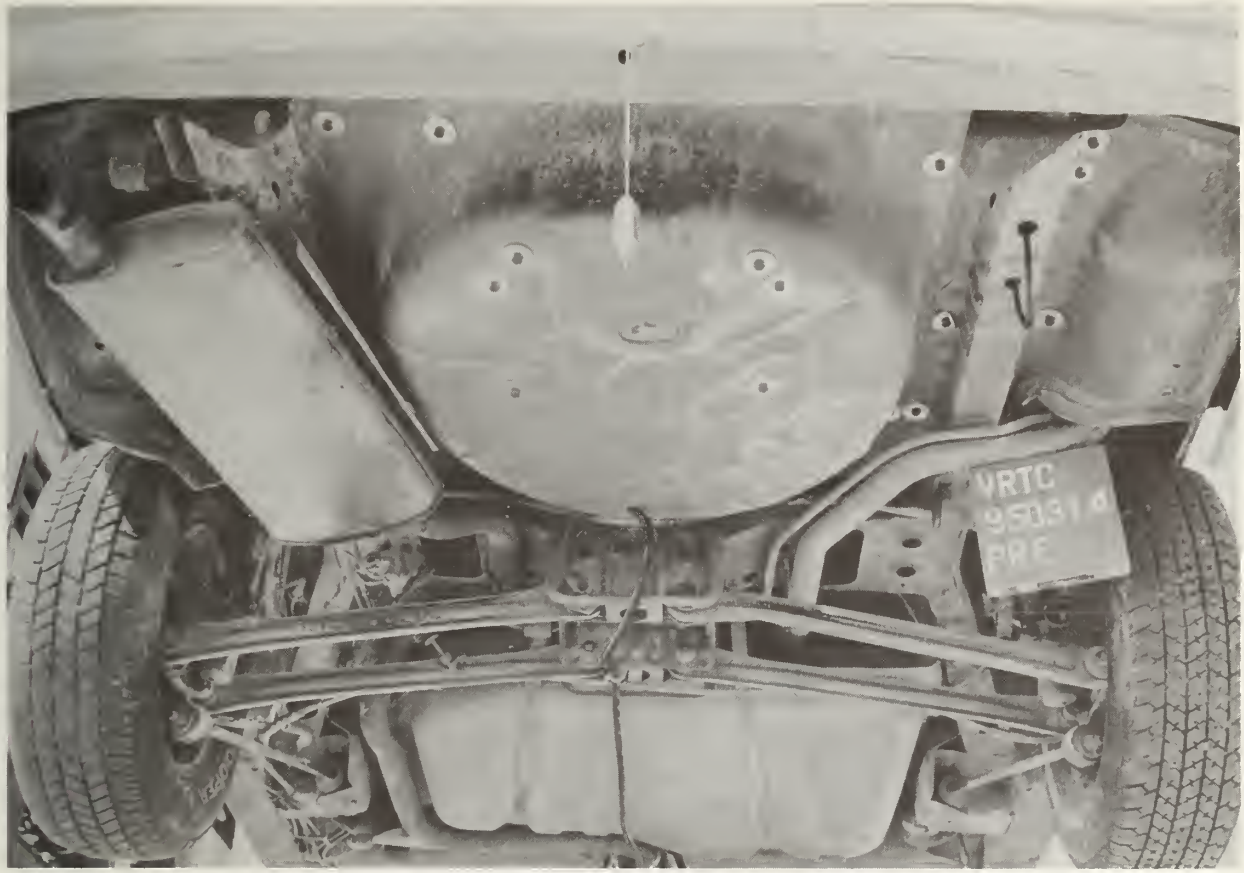


Figure A-18 Pre-Test Rear Underbody View

Figure A-19 Post-Test Rear Underbody View

Figure A-20 Pre-Test Windshield View

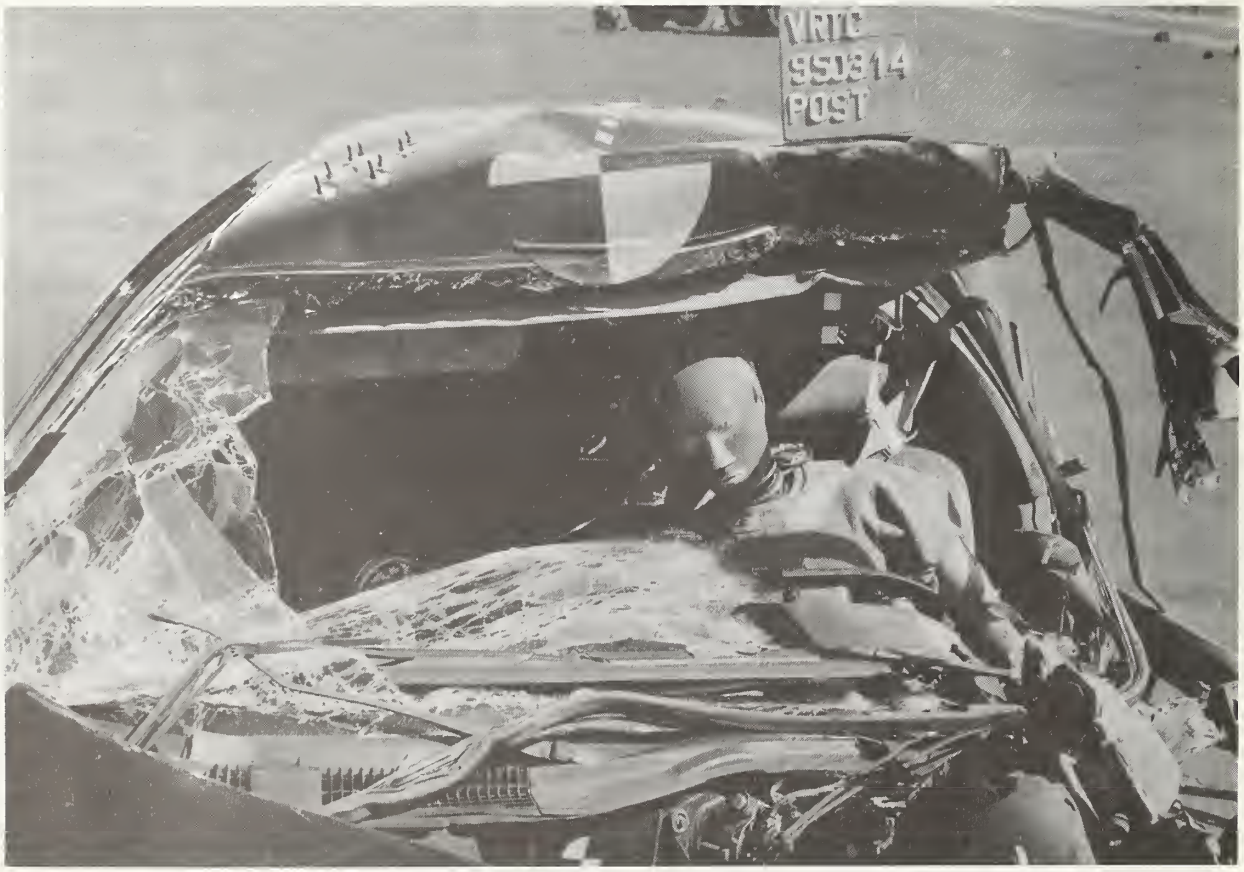


Figure A-21 Post-Test Windshield - View 1

Figure A-22 Post-Test Windshield - View 2

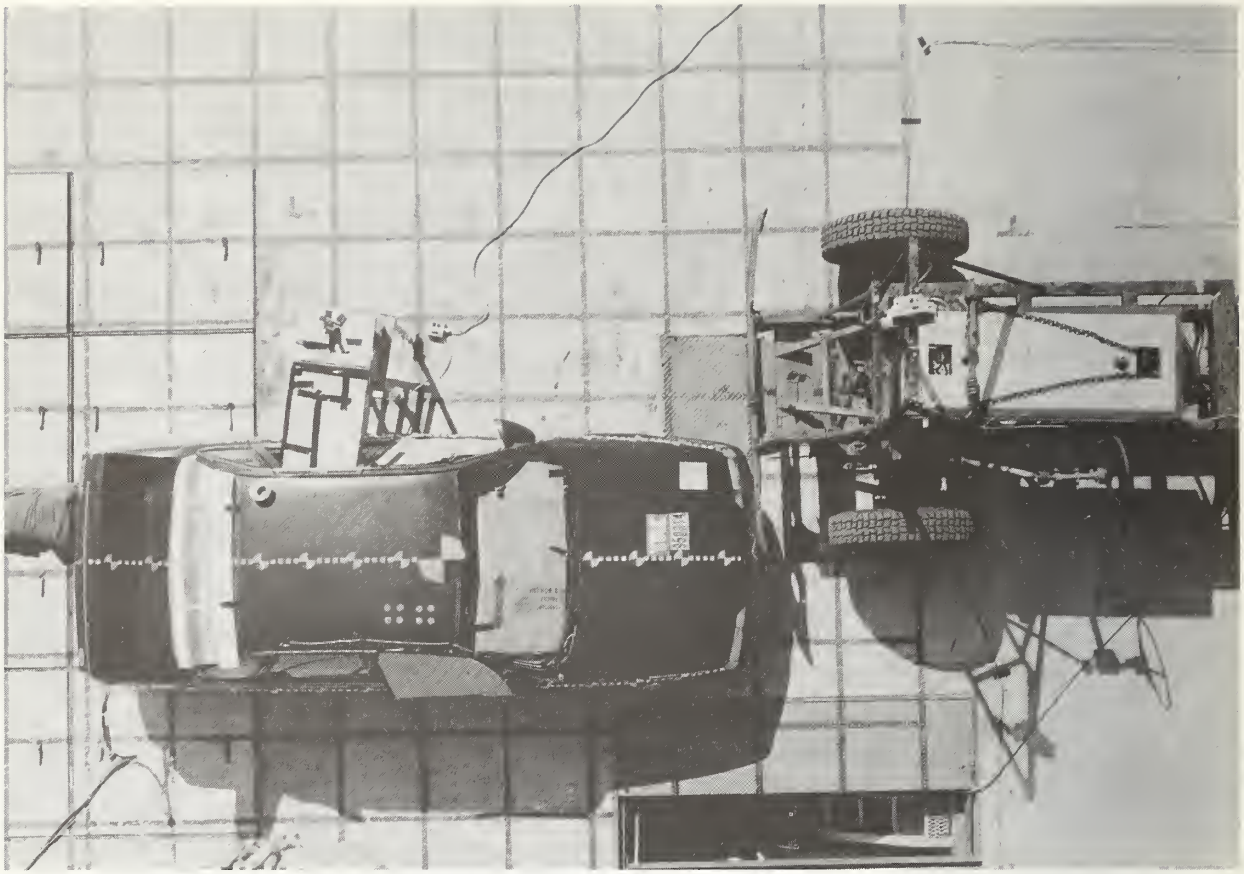


Figure A-23 Pre-Test Overhead View

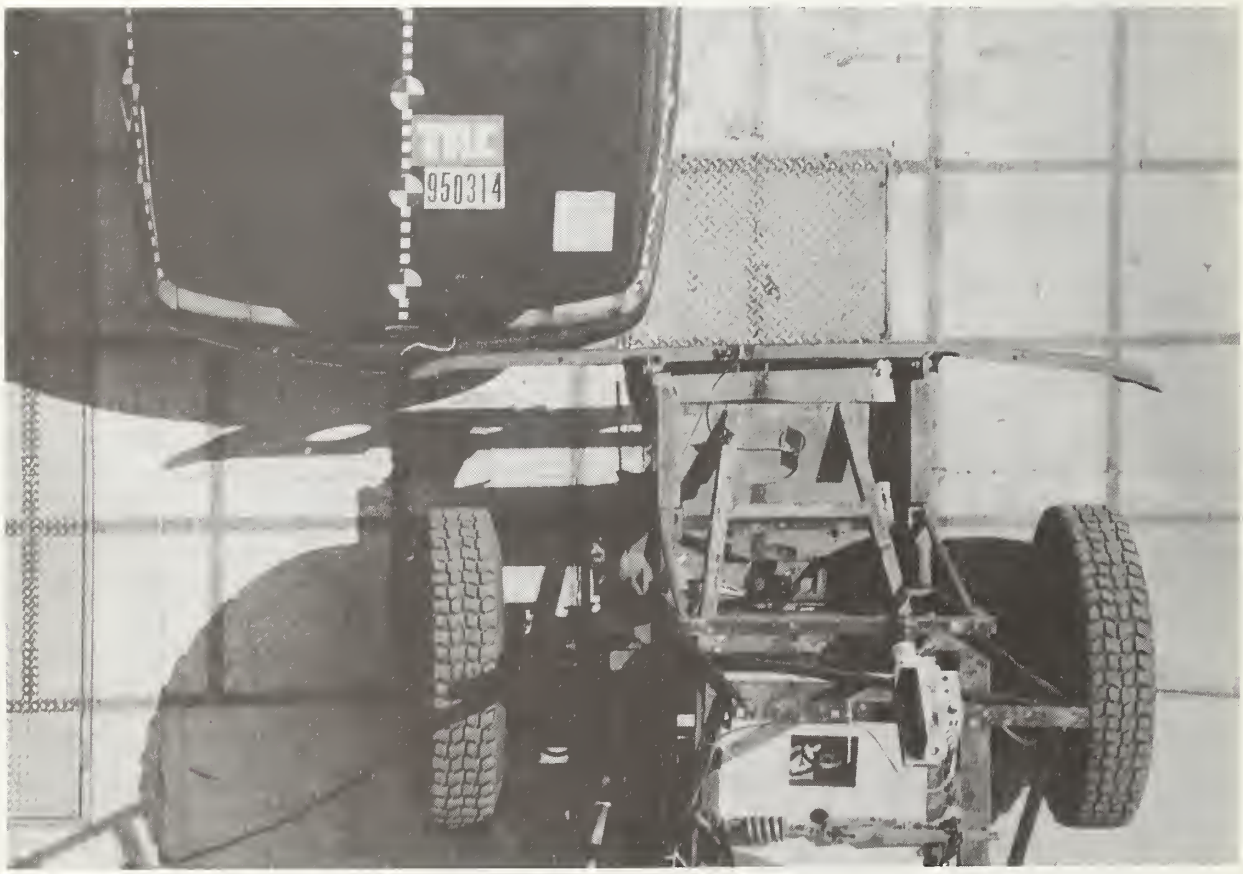


Figure A-24 Pre-Test Overhead Close-up View

Figure A-25 Pre-Test Bumper Engagement - View 1

Figure A-26 Pre-Test Bumper Engagement - View 2

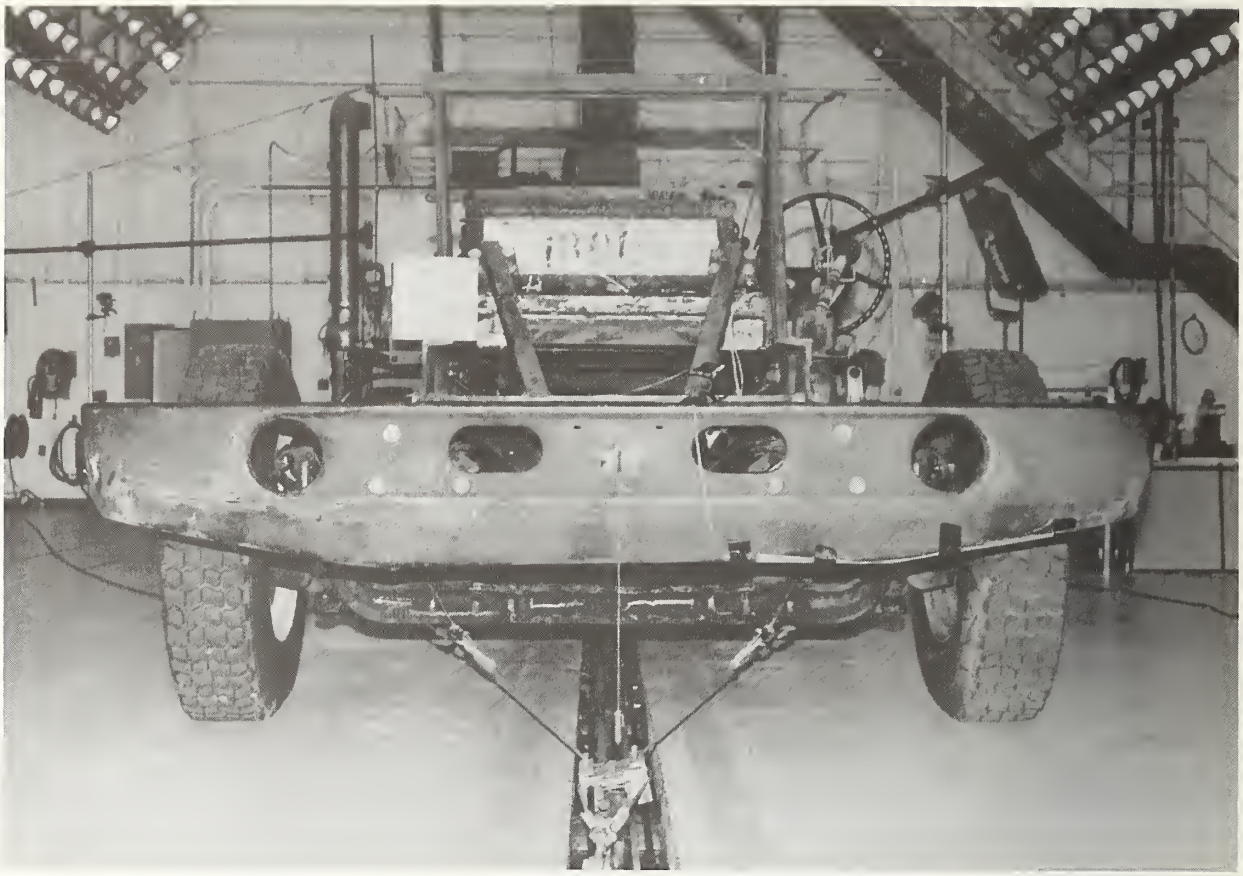


Figure A-27 Pre-Test Truck Front View

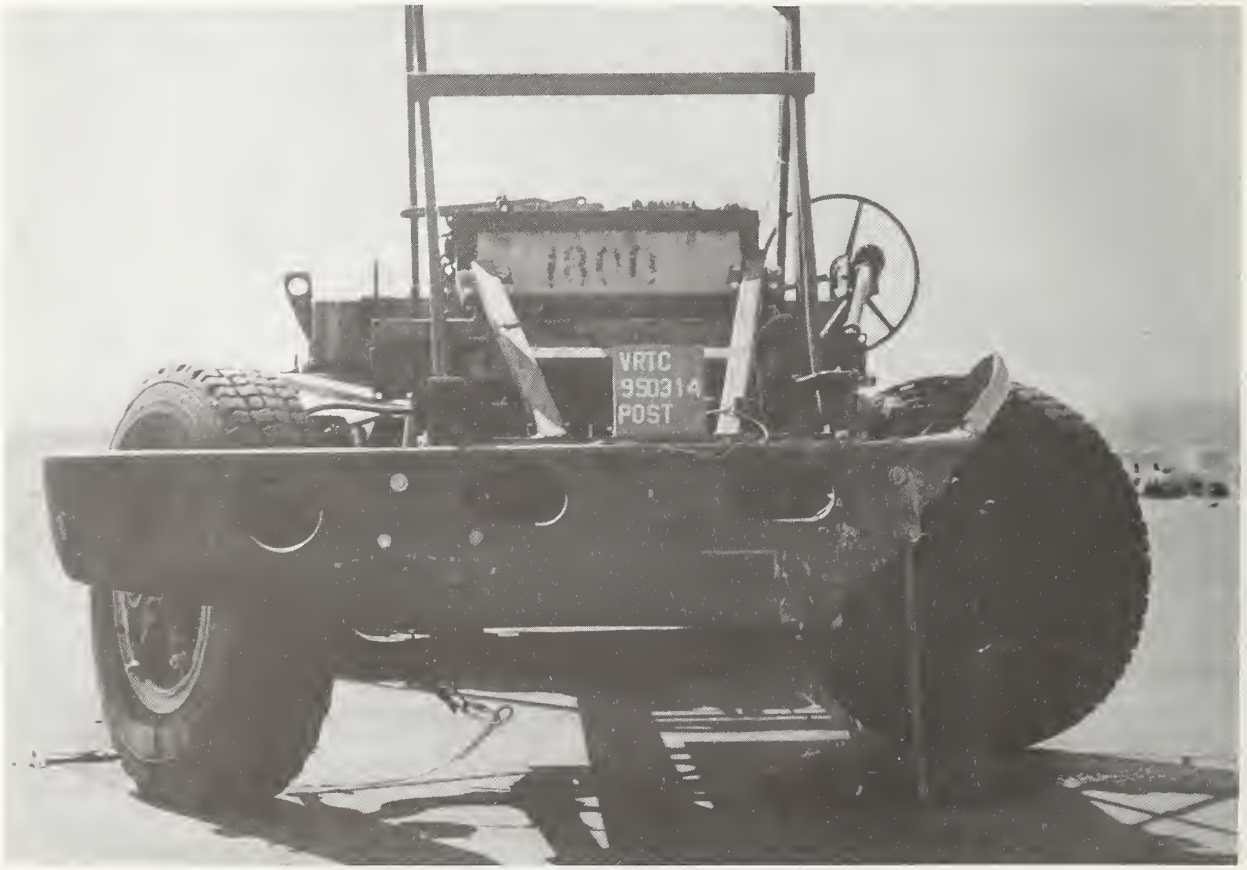


Figure A-28 Post-Test Truck Front View

Figure A-29 Post-Test Truck Damage - View 1

Figure A-30 Post-Test Truck Damage - View 2

Figure A-31 Post-Test Truck Damage - View 3

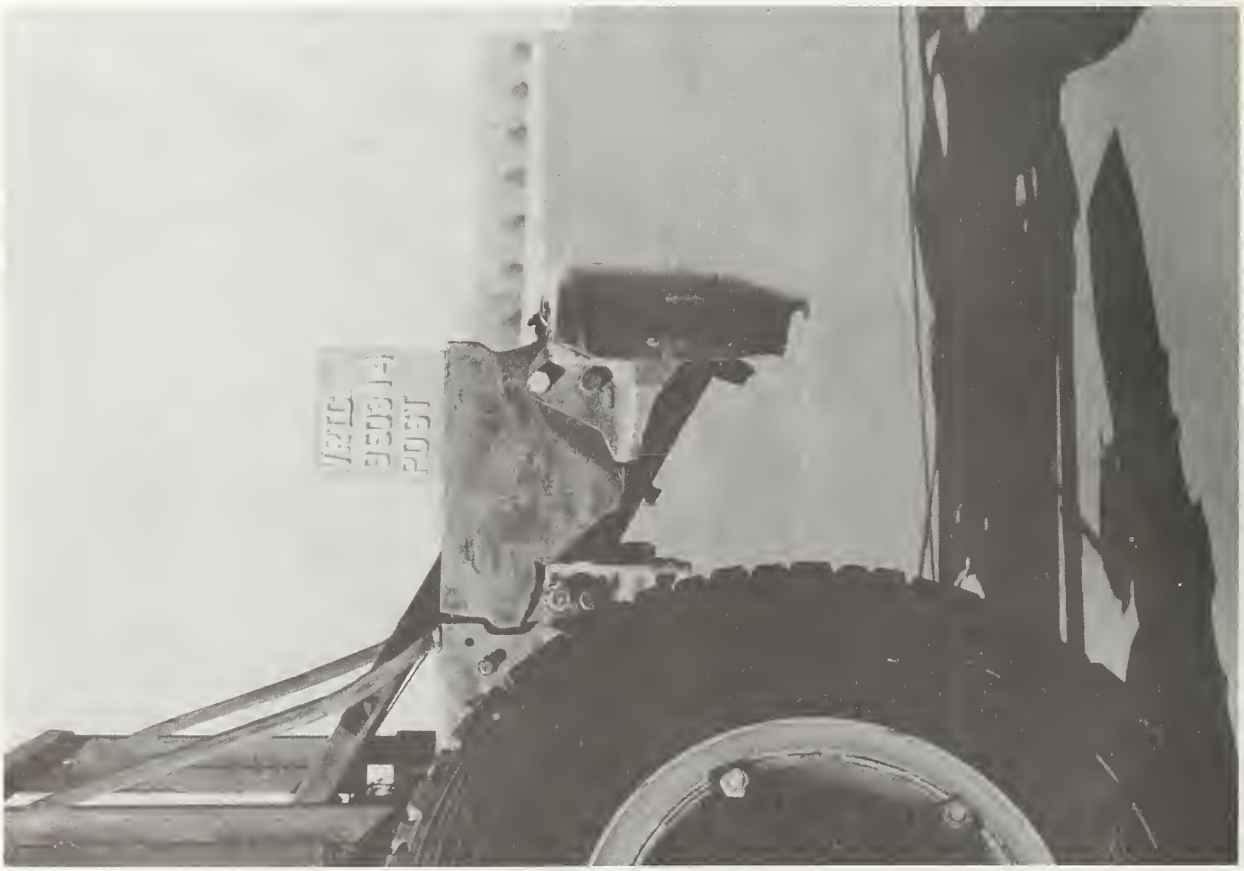


Figure A-32 Post-Test Truck Damage - View 4

Figure A-33 Pre-Test Driver Dummy Position View

Figure A-34 Pre-Test Dummy and Vehicle Interior - View 1

Figure A-35 Pre-Test Dummy and Vehicle Interior - View 2

Figure A-36 Post-Test Driver dummy and Vehicle Interior - View 1

Figure A-37 Post-Test Driver dummy and Vehicle Interior - View 2

Figure A-38 Post-Test Driver dummy and Vehicle Interior - View 3

Figure A-39 Post-Test Driver dummy and Vehicle Interior - View 4

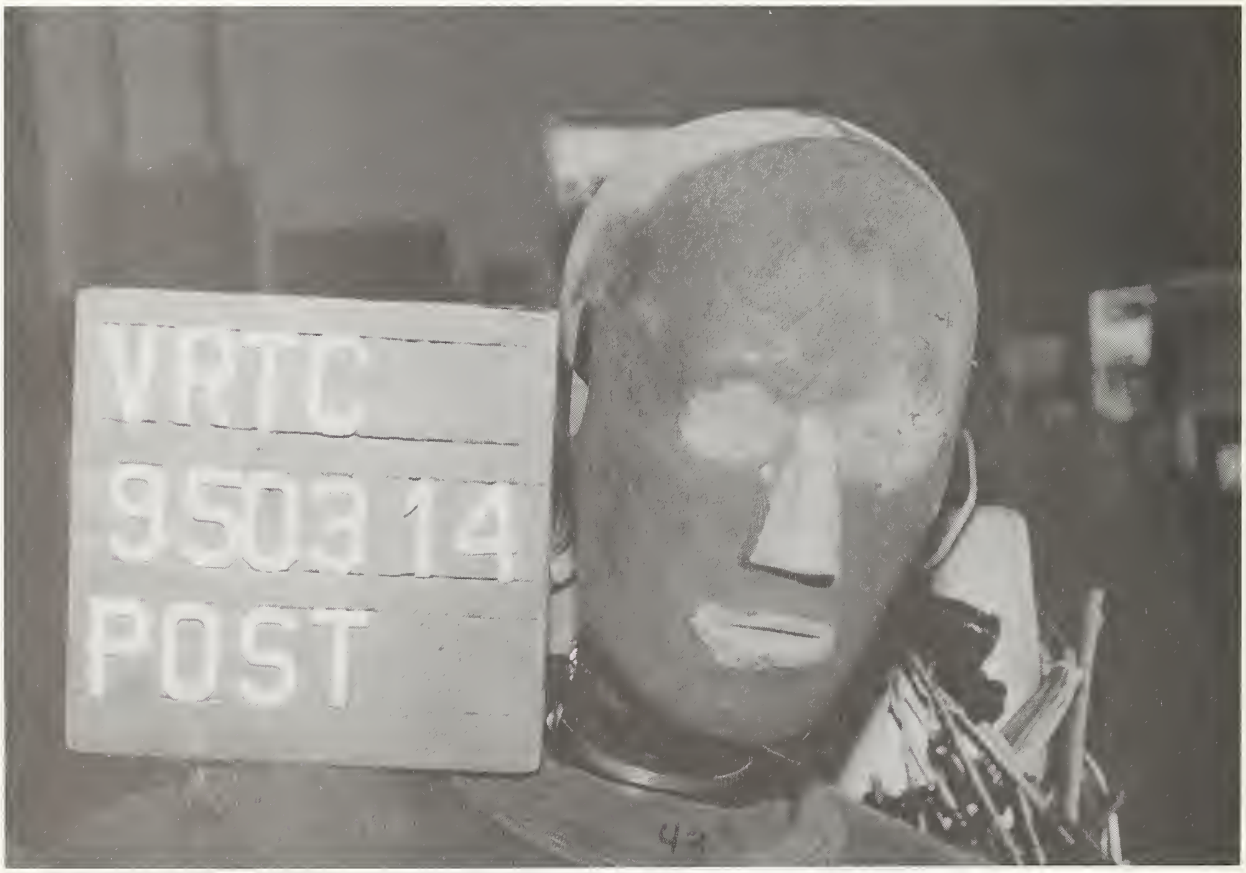


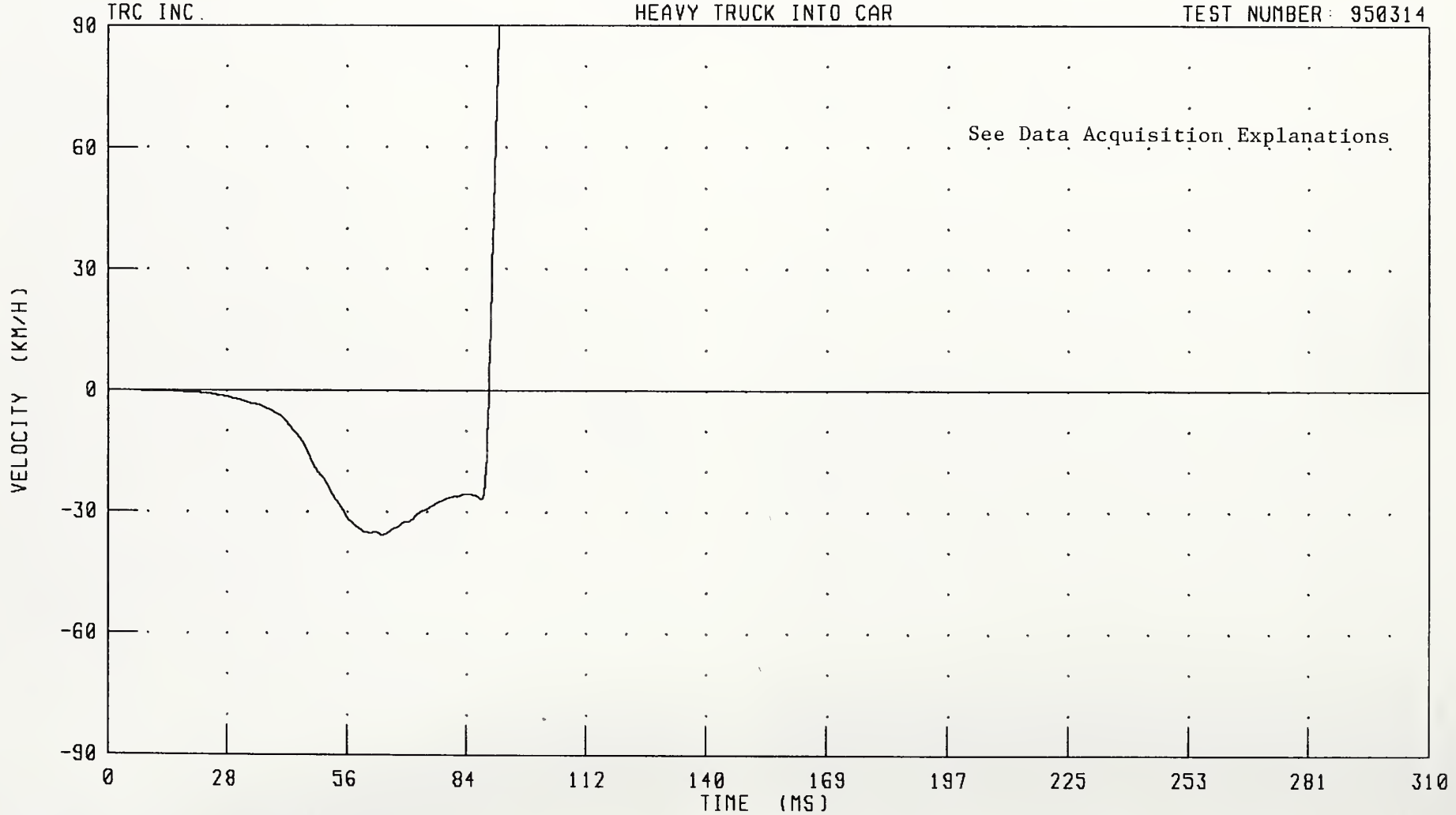
Figure A-40 Post-Test Driver Dummy Head Contact View

Figure A-41 Post-Test Driver Dummy Knee Contact View

Appendix B

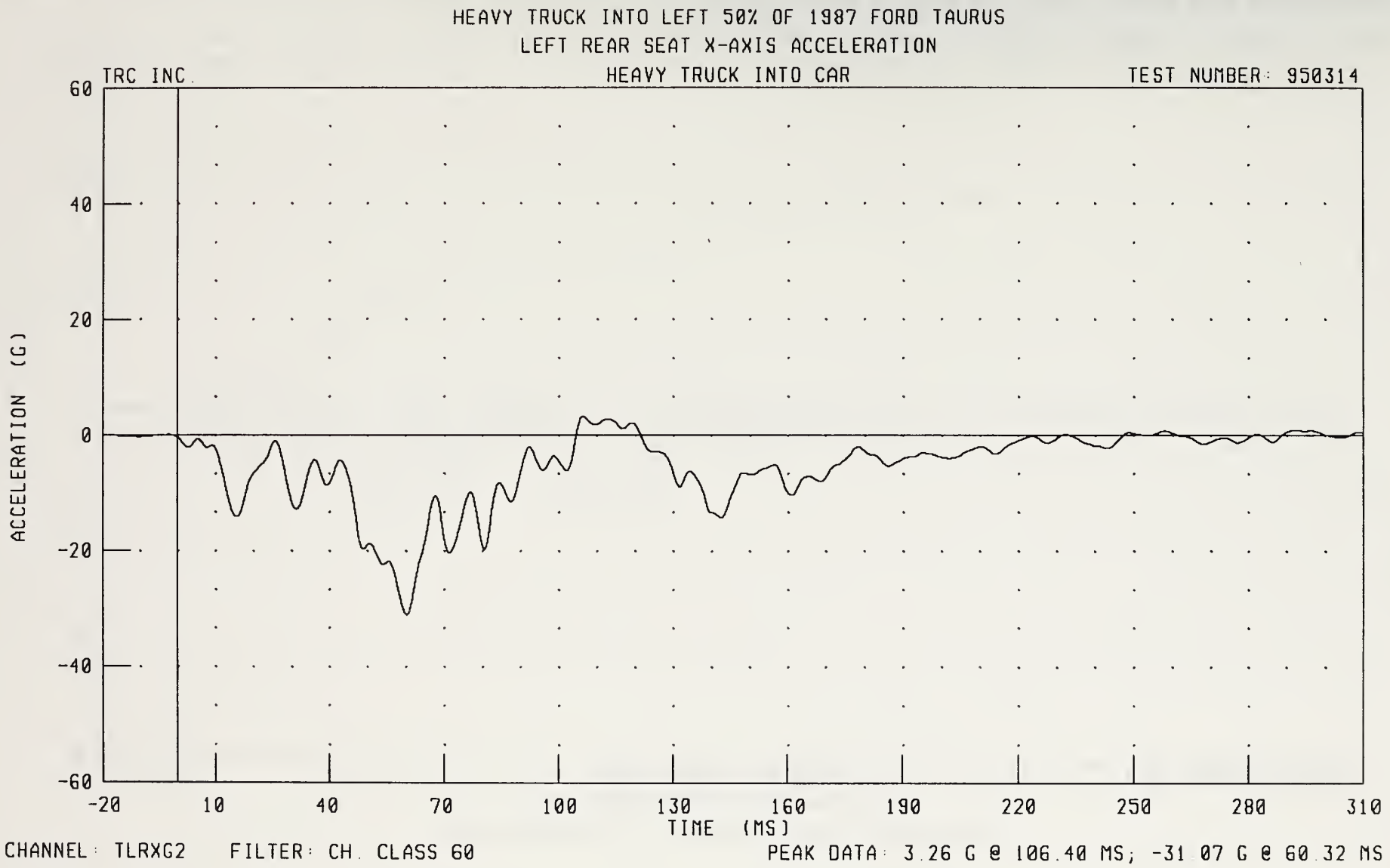
Data Plots

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
ENGINE BOTTOM X-AXIS VELOCITY

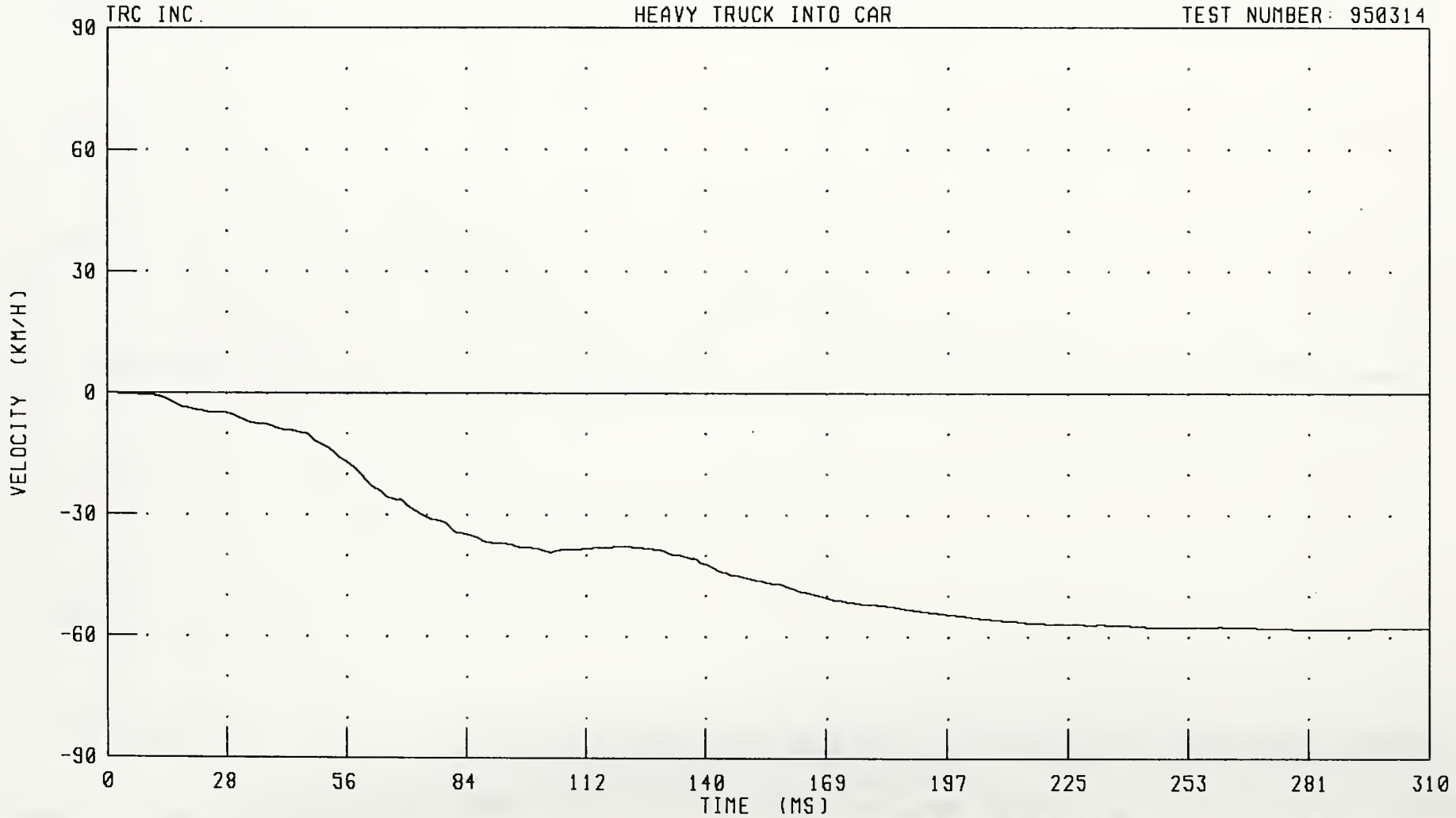


CHANNEL: ENGXV2 FILTER: CH. CLASS 180

PEAK DATA: 7369.50 KM/H @ 310.00 MS; -35.75 KM/H @ 64.40 MS

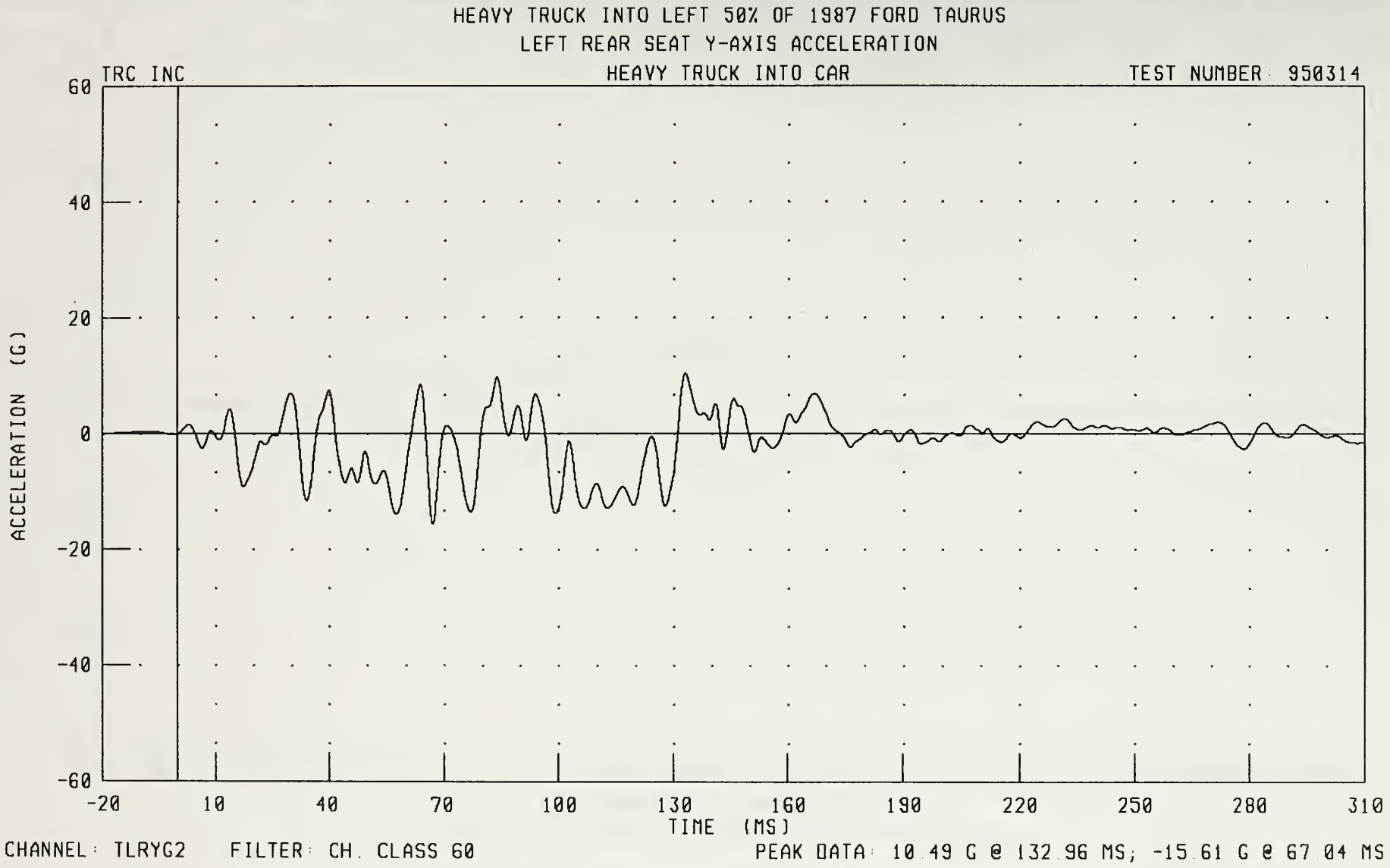

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
LEFT REAR SEAT X-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TLRXG2
FILTER: CH. CLASS 60
PEAK DATA: 3.26 G @ 106.40 MS; -31.07 G @ 60.32 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
LEFT REAR SEAT X-AXIS VELOCITY

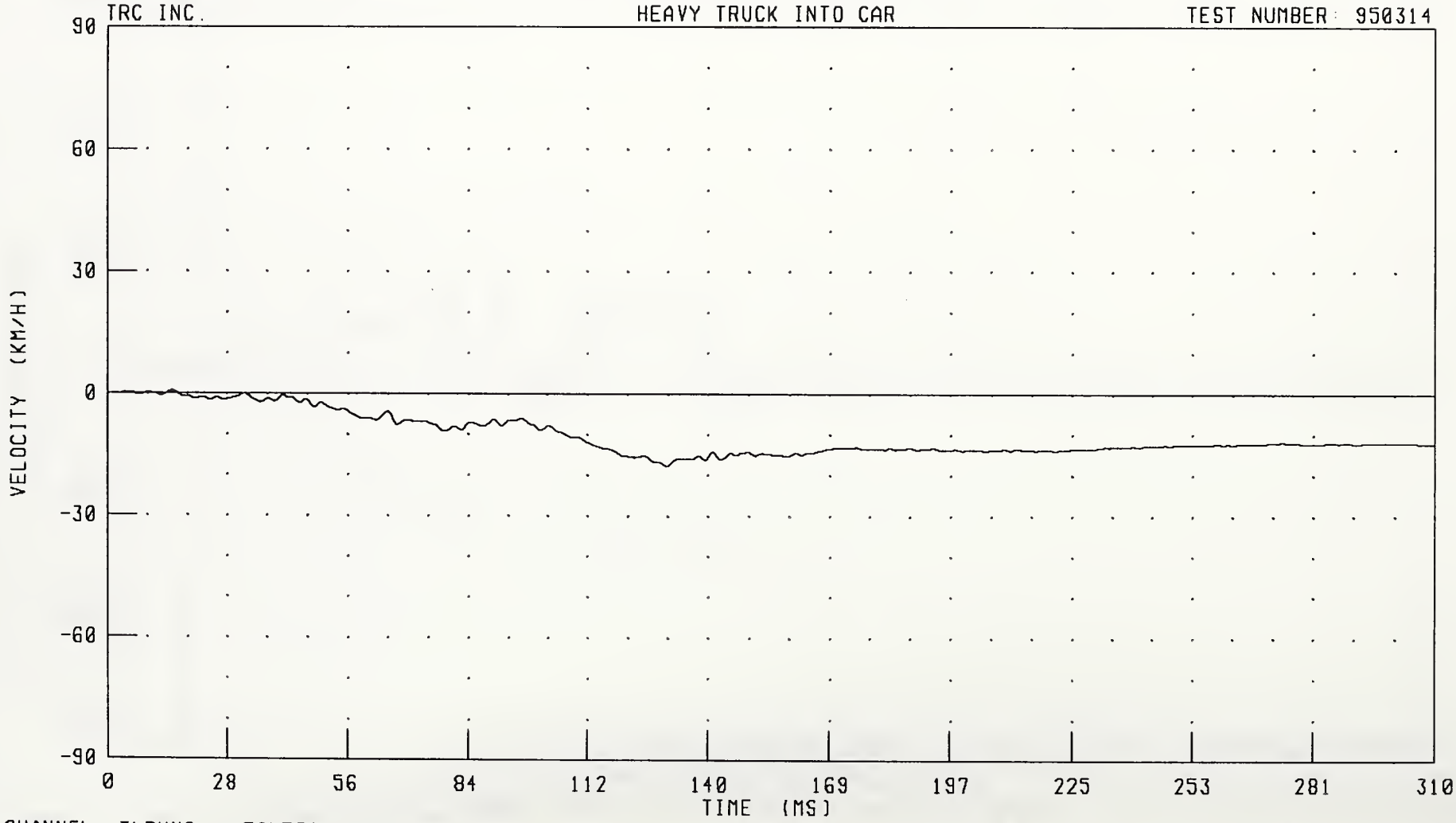


CHANNEL: TLRXV2 FILTER: CH. CLASS 180

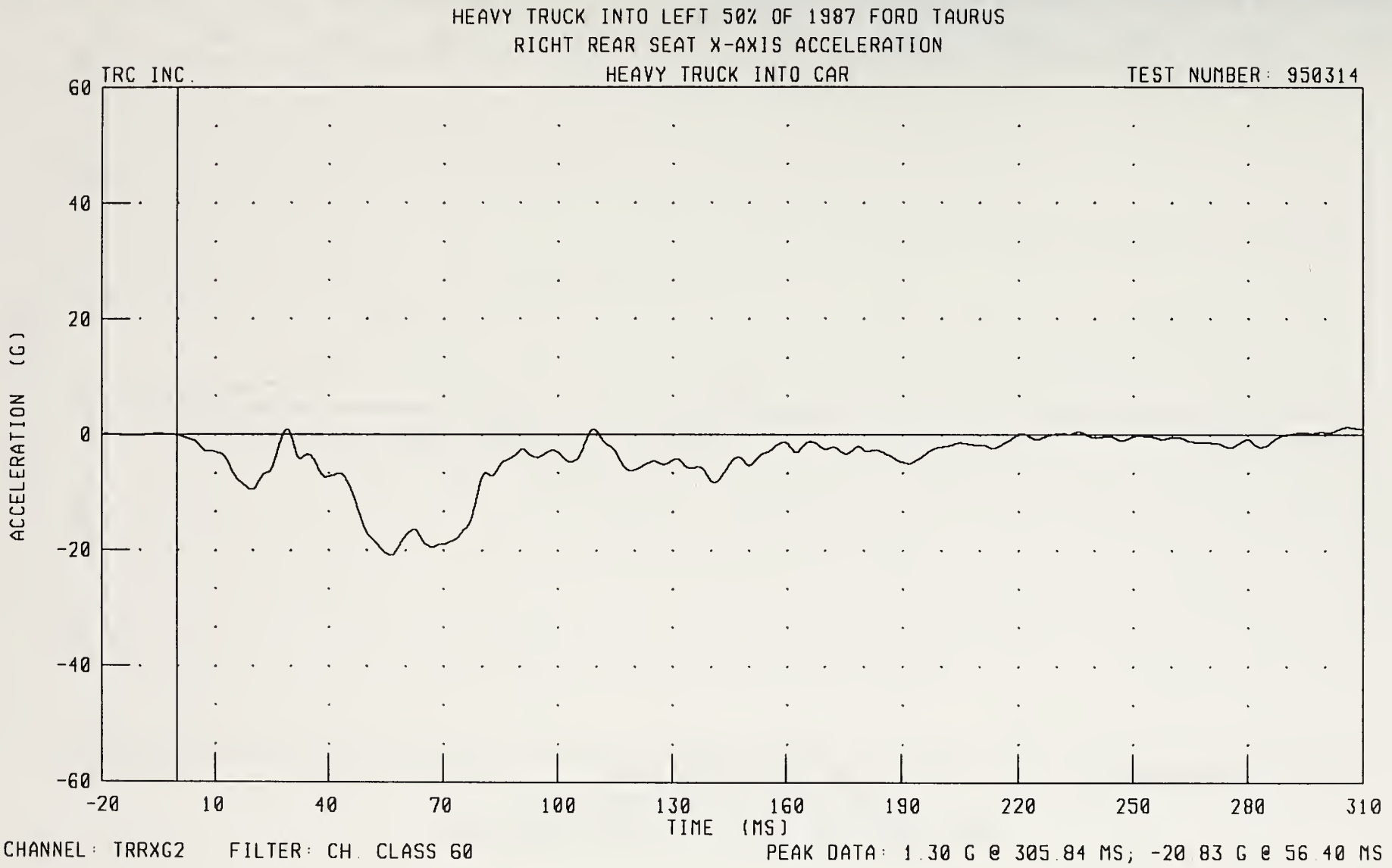
PEAK DATA: 0.01 KM/H @ 1.44 MS; -58.23 KM/H @ 288.56 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
LEFT REAR SEAT Y-AXIS ACCELERATION
TRC INC
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TLRYG2
FILTER: CH. CLASS 60
PEAK DATA: 10.49 G @ 132.96 MS; -15.61 G @ 67.04 MS

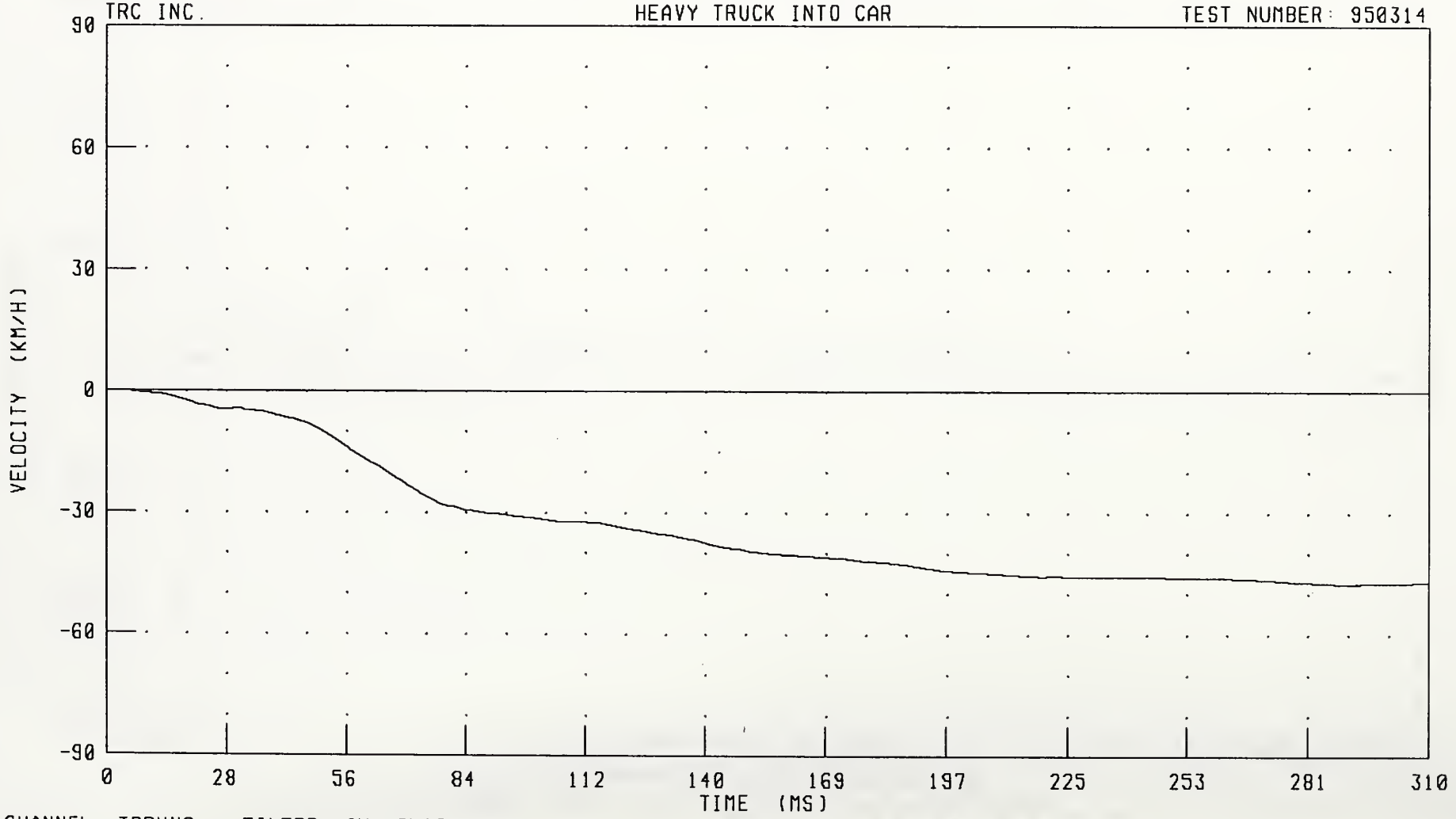
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
LEFT REAR SEAT Y-AXIS VELOCITY



CHANNEL: TLRYV2 FILTER: CH. CLASS 180 PEAK DATA: 0.66 KM/H @ 15.28 MS; -17.74 KM/H @ 131.36 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
RIGHT REAR SEAT X-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
60
40
20
0
-20
-40
-60
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TRRXG2
FILTER: CH CLASS 60
PEAK DATA: 1.30 G @ 305.84 MS; -20.83 G @ 56.40 MS

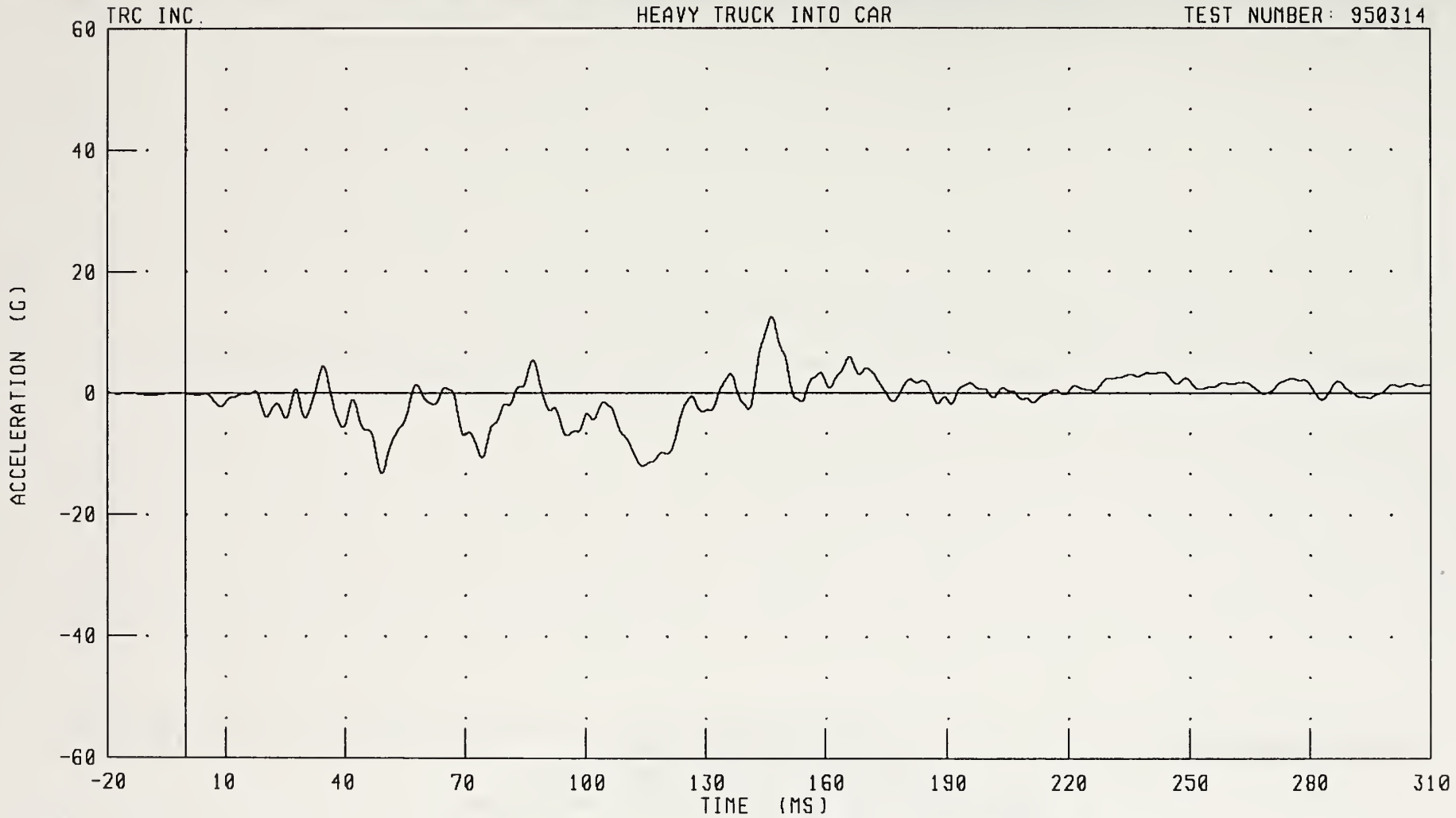
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
RIGHT REAR SEAT X-AXIS VELOCITY



CHANNEL: TRRXV2 FILTER: CH. CLASS 180

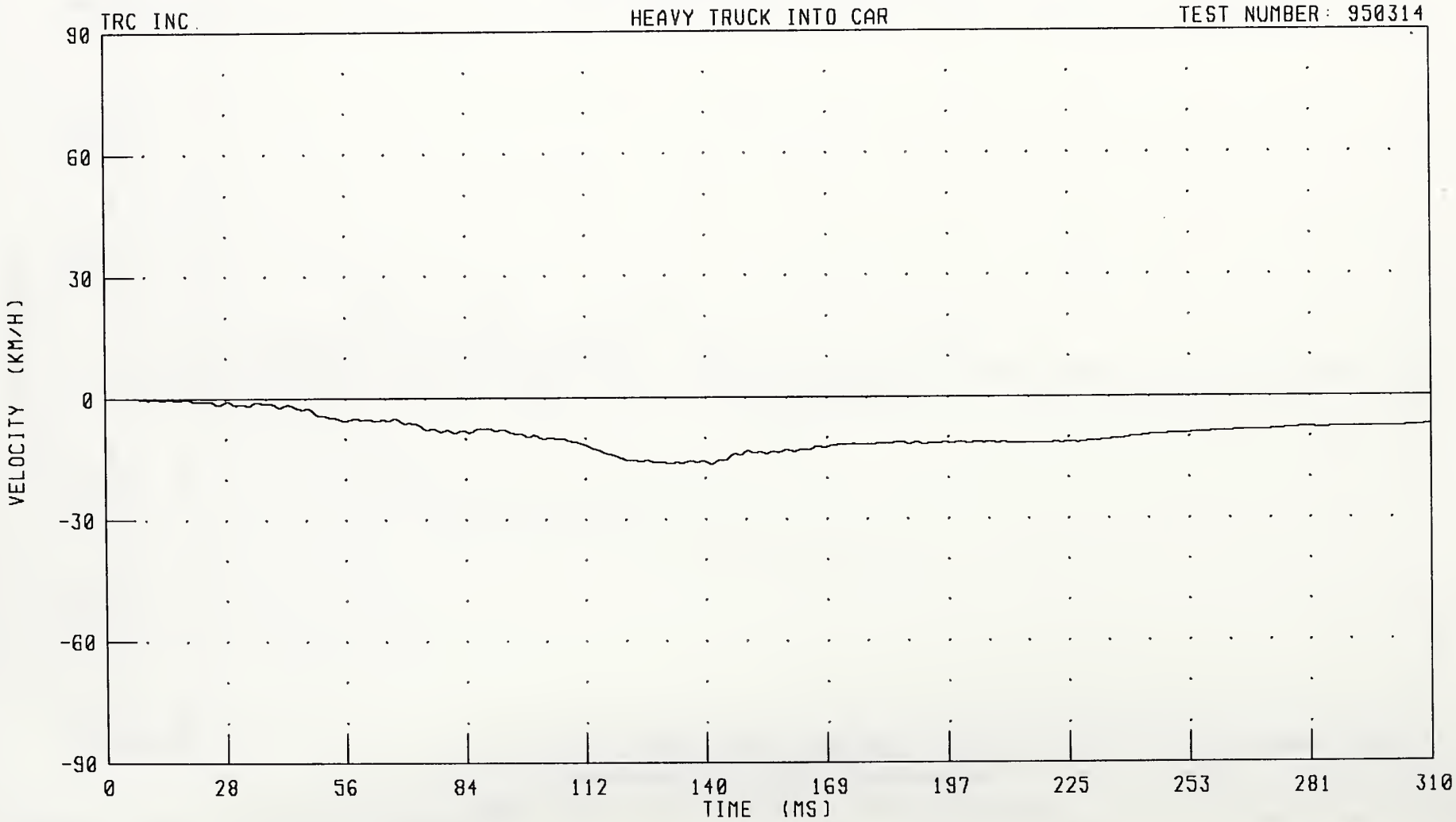
PEAK DATA: 0.00 KM/H @ 0.00 MS; -47.39 KM/H @ 291.36 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
RIGHT REAR SEAT Y-AXIS ACCELERATION



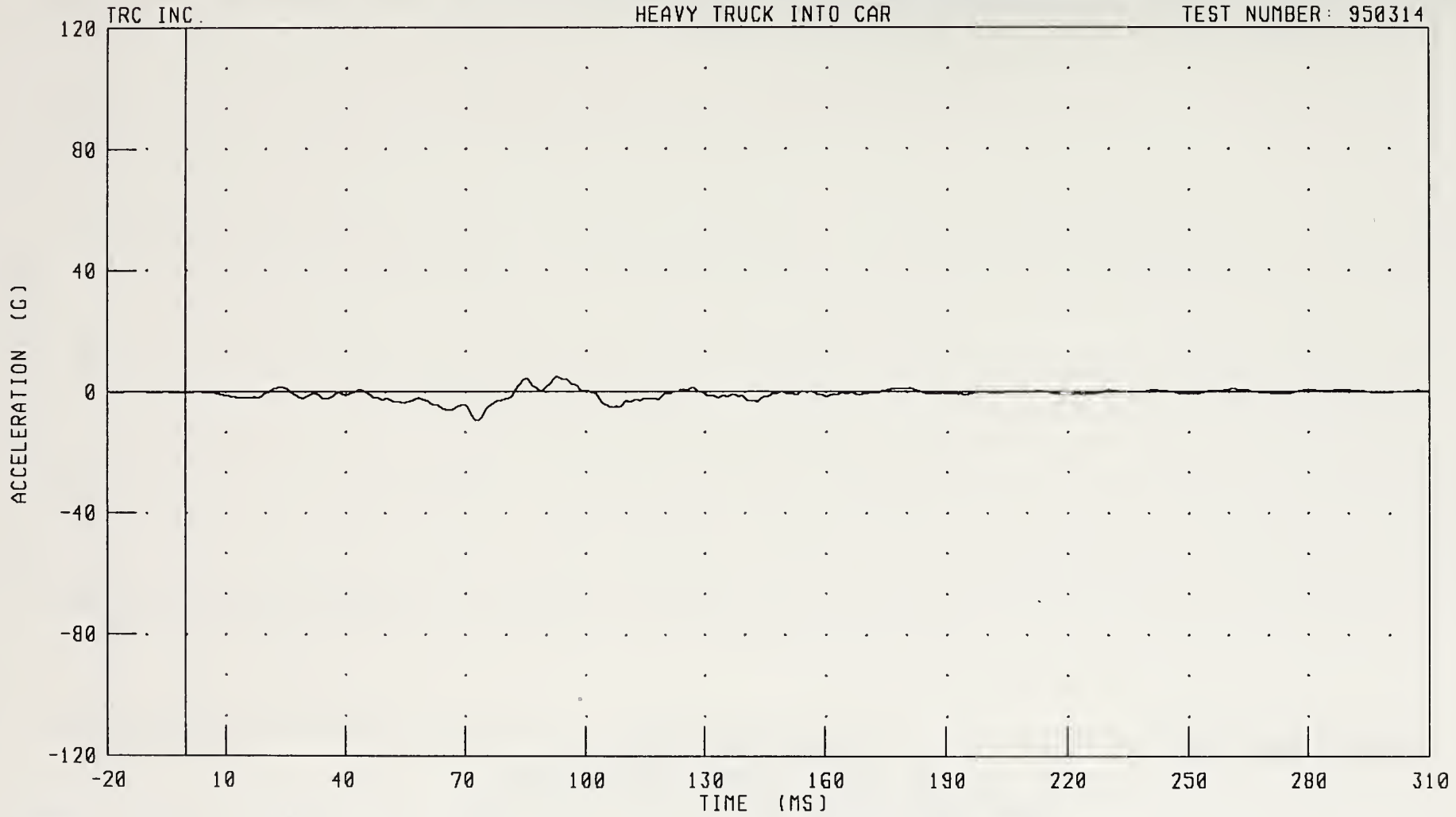
CHANNEL: TRRYG2 FILTER: CH. CLASS 60 PEAK DATA: 12.60 G @ 146.48 MS; -13.20 G @ 49.20 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
RIGHT REAR SEAT Y-AXIS VELOCITY

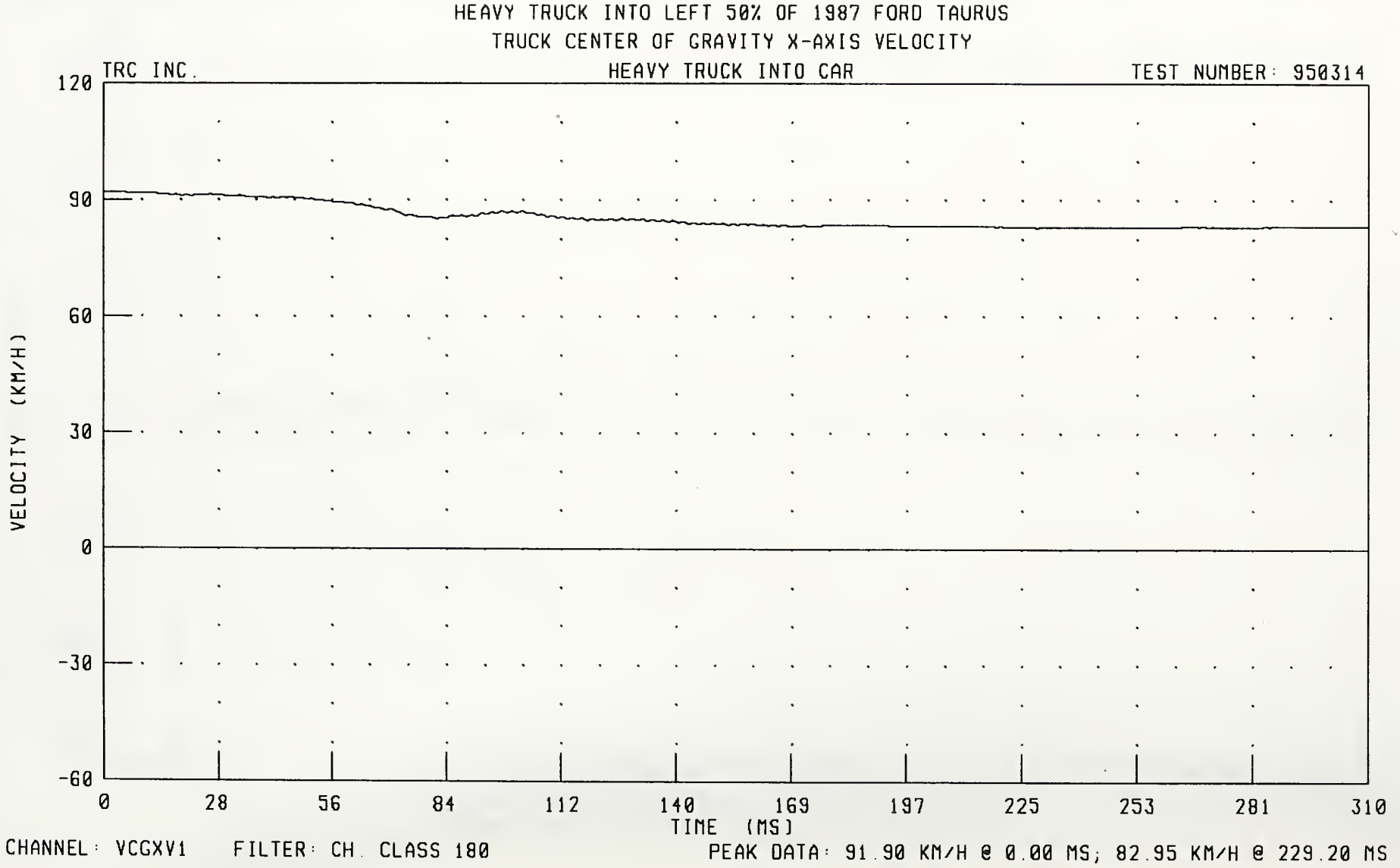


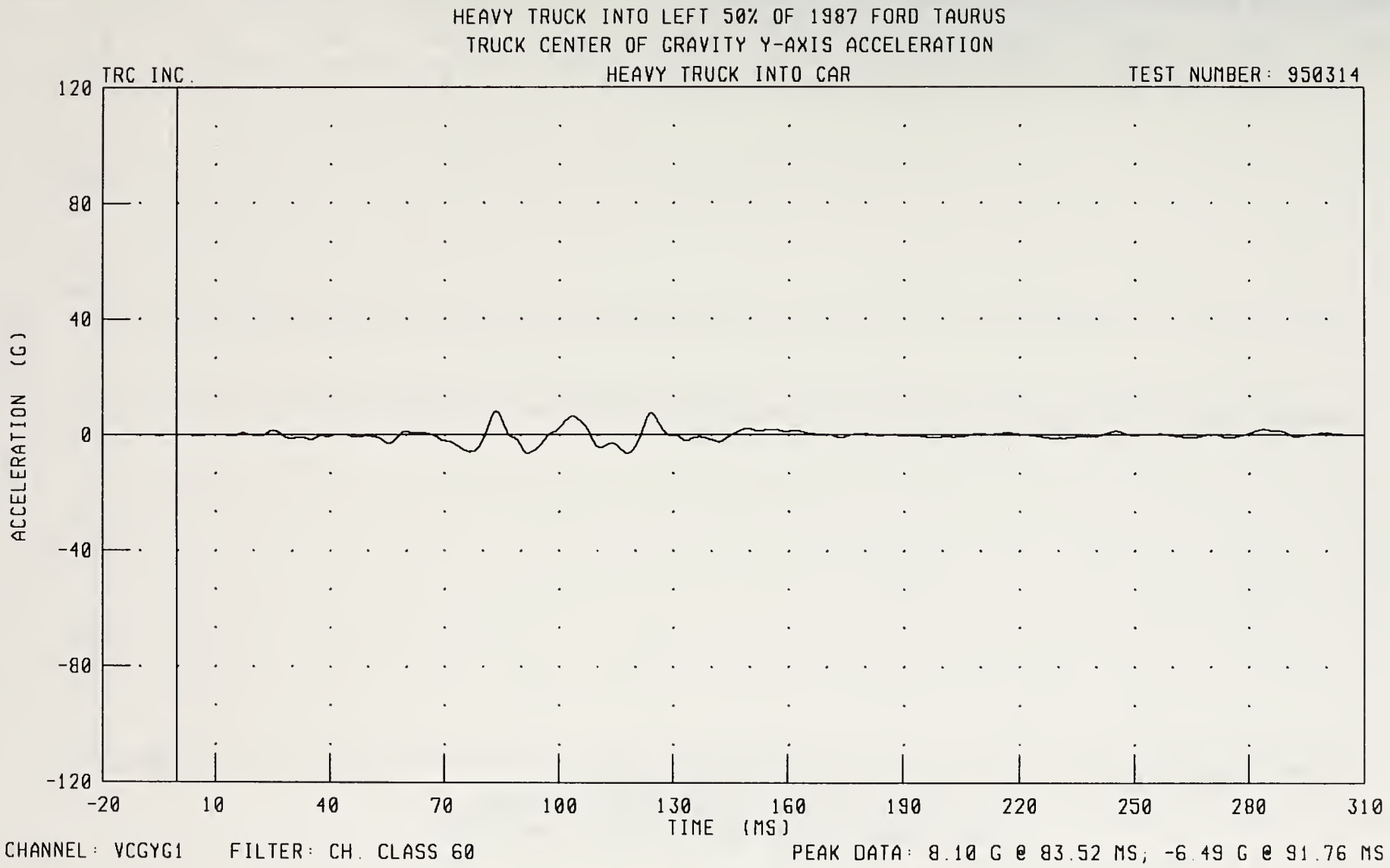
CHANNEL: TRRYV2 FILTER: CH. CLASS 180 PEAK DATA: 0.02 KM/H @ 6.48 MS; -16.47 KM/H @ 142.40 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY X-AXIS ACCELERATION

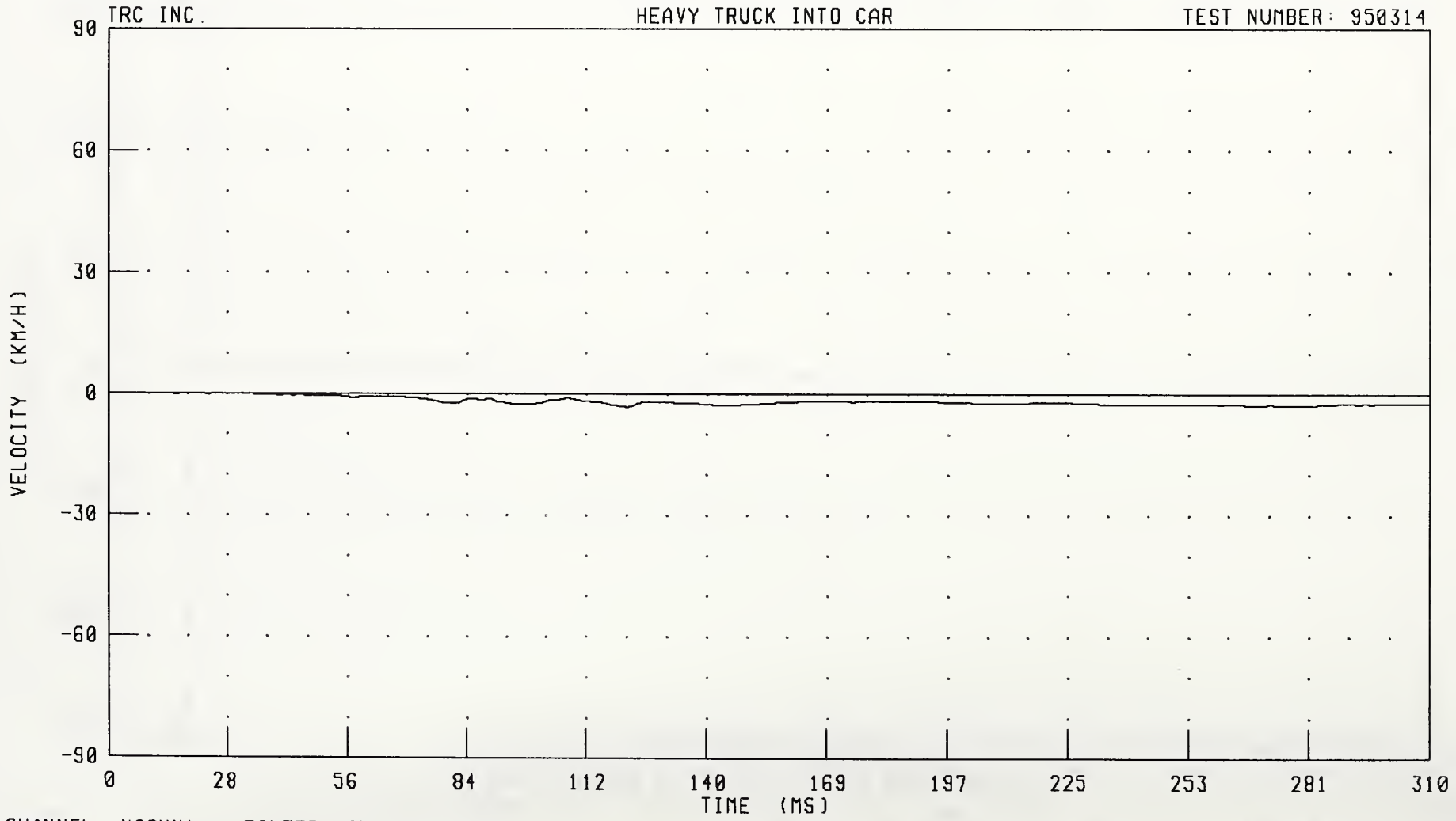


CHANNEL: VCGXG1 FILTER: CH. CLASS 60 PEAK DATA: 4.98 G @ 92.72 MS; -9.53 G @ 72.96 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY X-AXIS VELOCITY
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
120
90
60
30
0
-30
-60
VELOCITY (KM/H)
0
28
56
84
112
140
169
197
225
253
281
310
TIME (MS)
CHANNEL: VCGXV1
FILTER: CH. CLASS 180
PEAK DATA: 91.90 KM/H @ 0.00 MS; 82.95 KM/H @ 229.20 MS

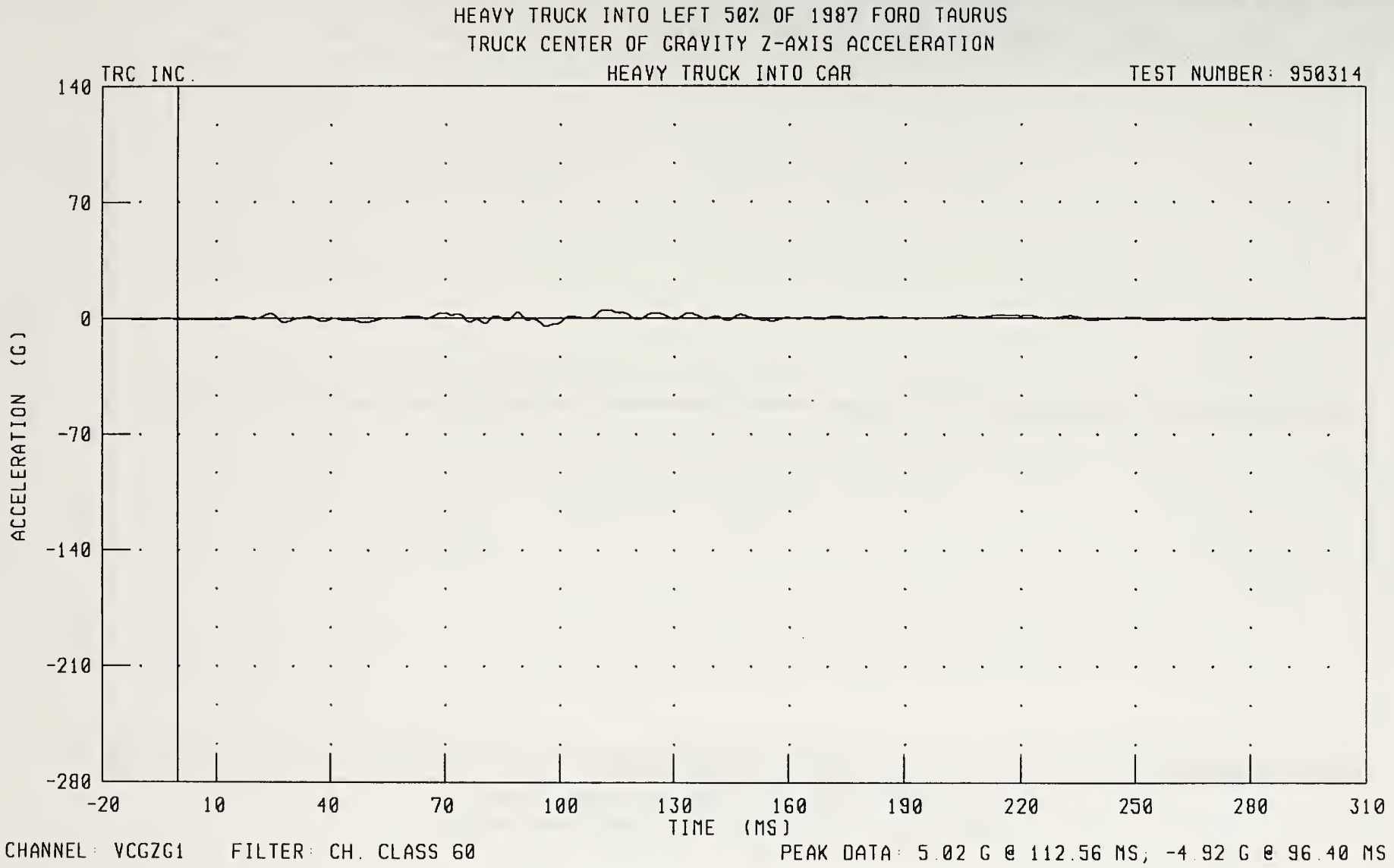

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Y-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
120
80
40
0
-40
-80
-120
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGYG1
FILTER: CH. CLASS 60
PEAK DATA: 8.10 G @ 83.52 MS; -6.49 G @ 91.76 MS

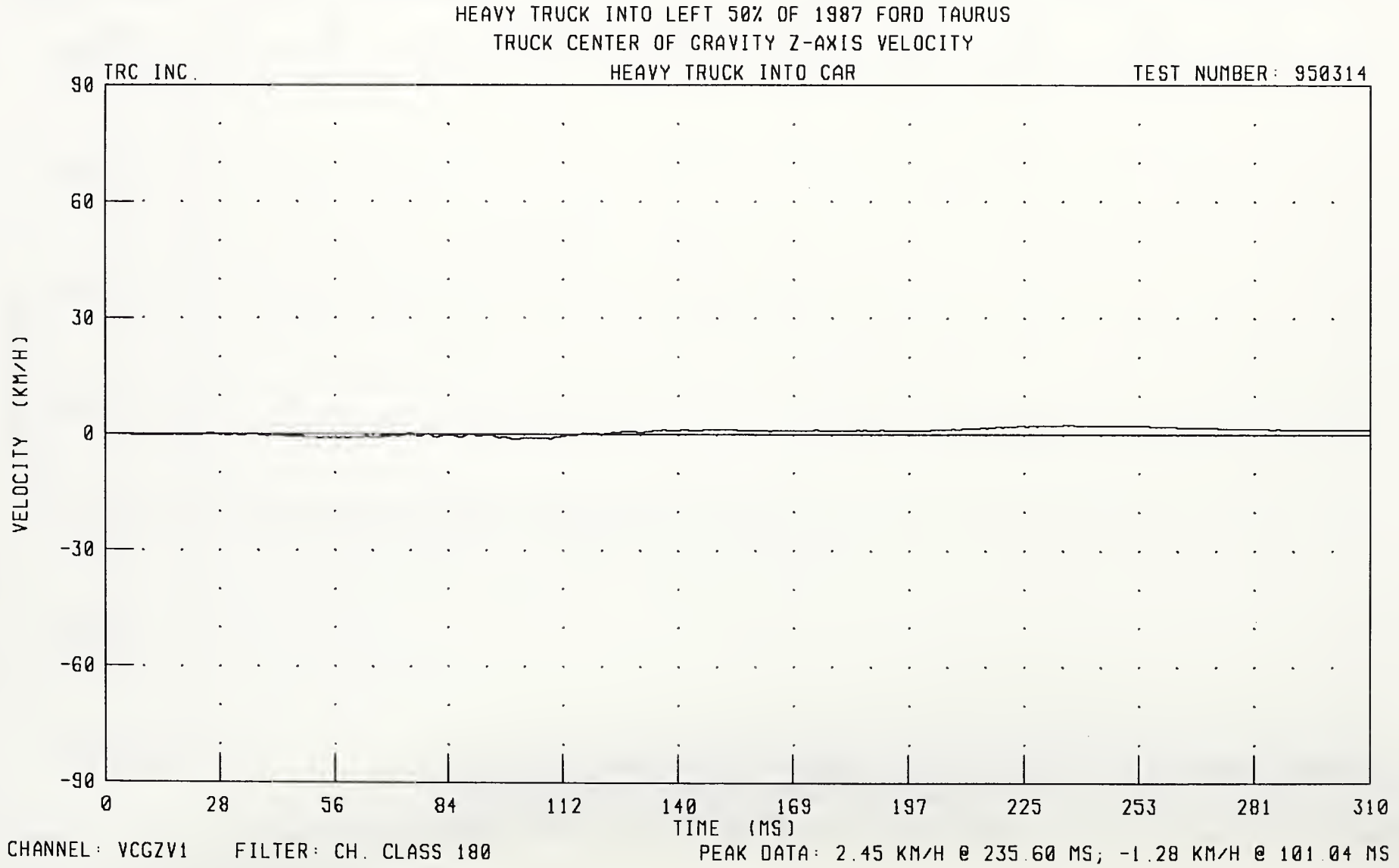
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Y-AXIS VELOCITY



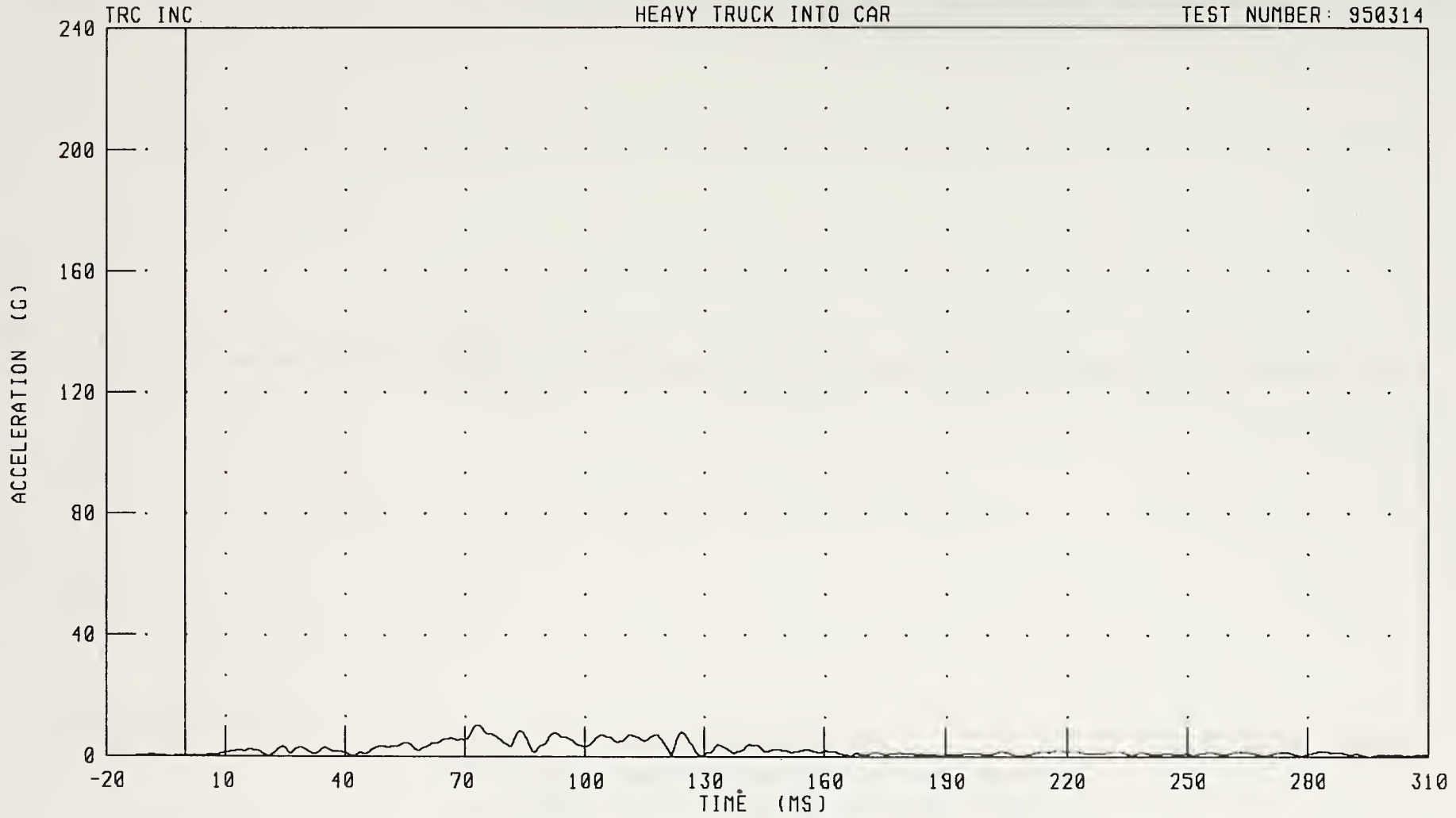
CHANNEL: VCGYV1 FILTER: CH. CLASS 180

PEAK DATA: 0.14 KM/H @ 27.44 MS; -3.18 KM/H @ 122.24 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Z-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
140
70
0
-70
-140
-210
-280
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: VCGZG1
FILTER: CH. CLASS 60
PEAK DATA: 5.02 G @ 112.56 MS; -4.92 G @ 96.40 MS

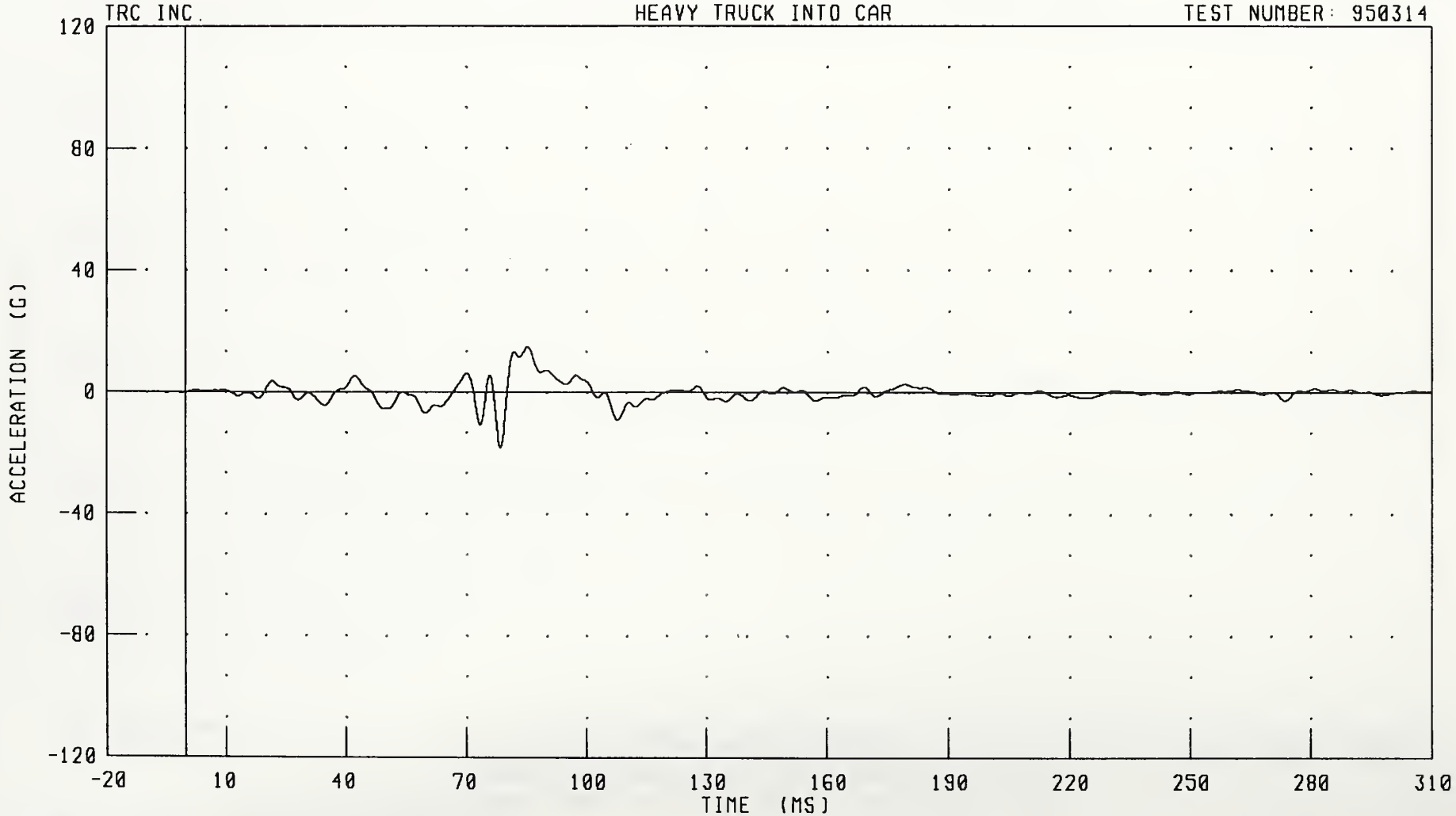

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY Z-AXIS VELOCITY
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
90
60
30
0
-30
-60
-90
VELOCITY (KM/H)
0
28
56
84
112
140
169
197
225
253
281
310
TIME (MS)
CHANNEL: VCGZV1
FILTER: CH. CLASS 180
PEAK DATA: 2.45 KM/H @ 235.60 MS; -1.28 KM/H @ 101.04 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK CENTER OF GRAVITY RESULTANT ACCELERATION



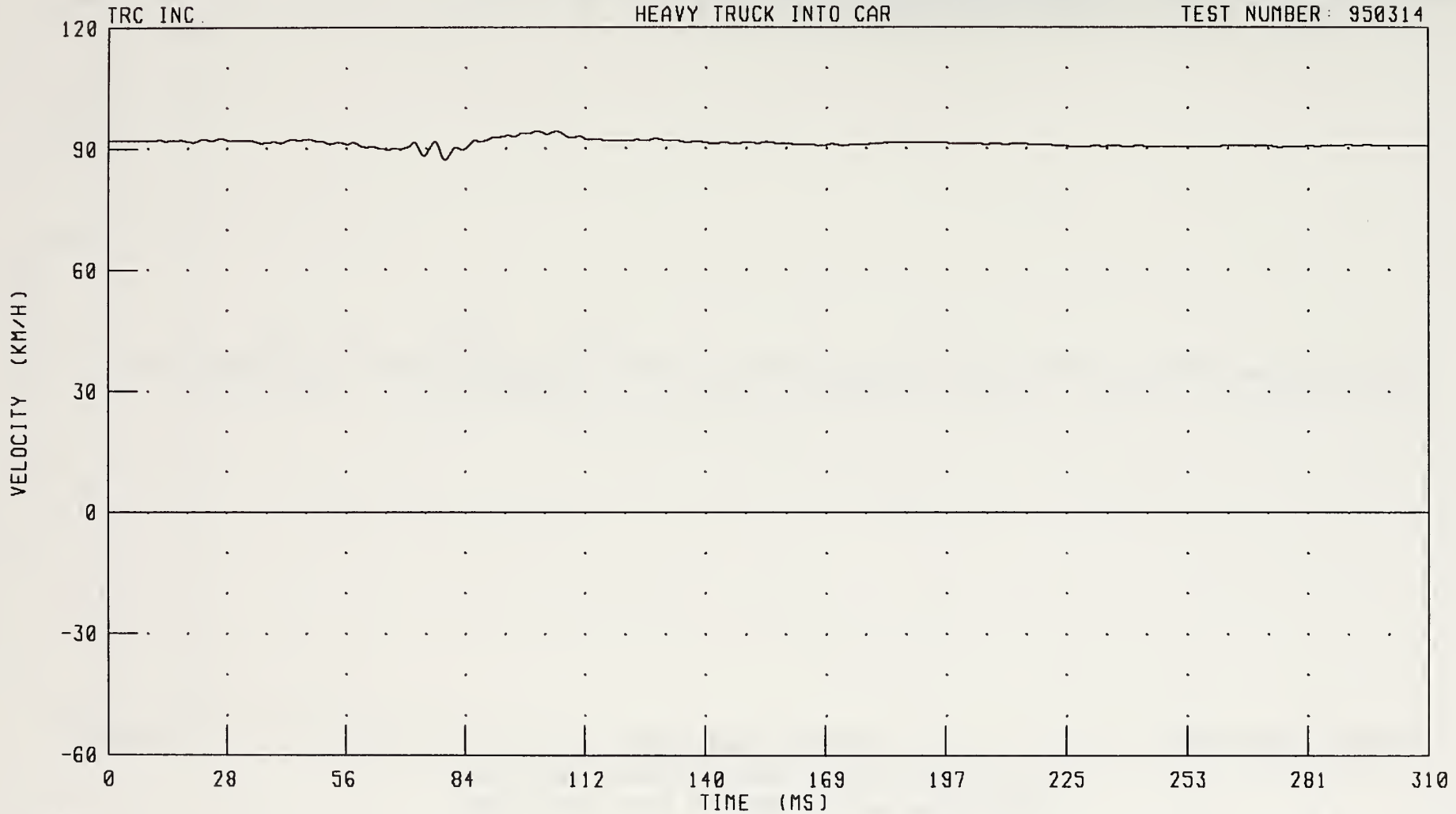
CHANNEL: VCGRG1 FILTER: CH. CLASS 60 PEAK DATA: 10.45 G @ 73.28 MS; 0.08 G @ -20.00 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER X-AXIS ACCELERATION



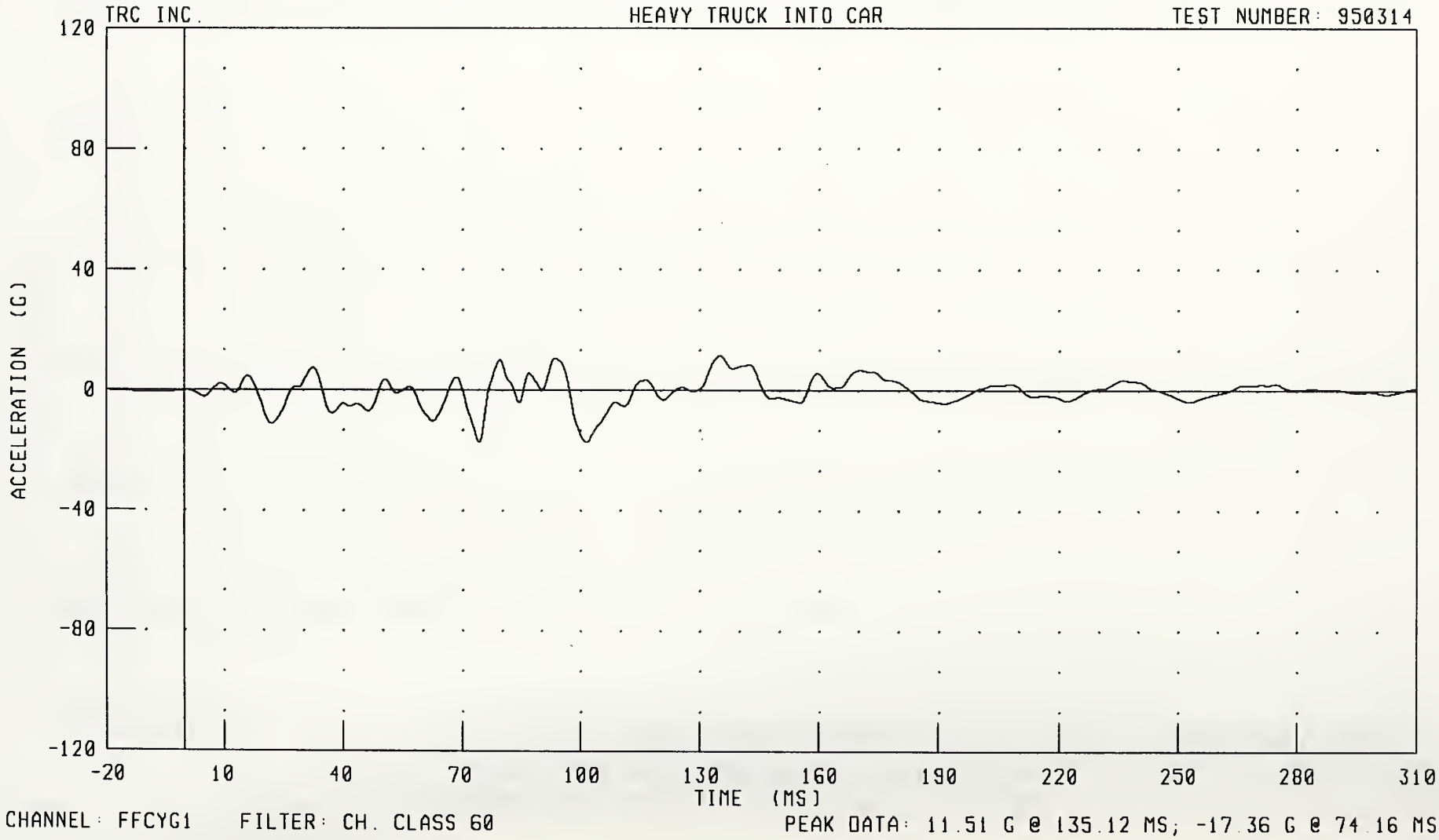
CHANNEL: FFCXG1 FILTER: CH. CLASS 60 PEAK DATA: 14.91 G @ 85.28 MS; -18.26 G @ 78.48 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER X-AXIS VELOCITY



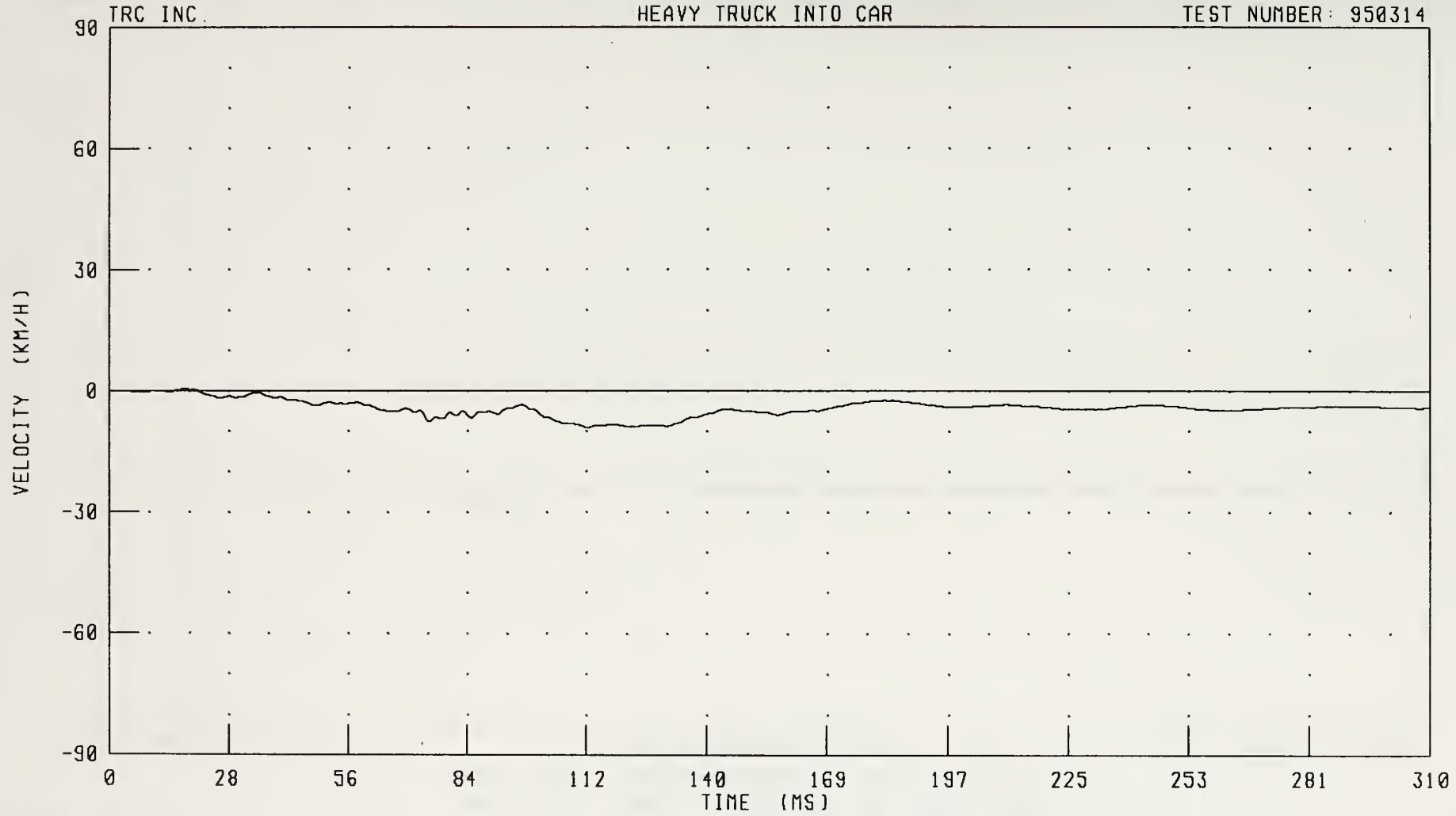
CHANNEL: FFCXV1 FILTER: CH. CLASS 180 PEAK DATA: 94.33 KM/H @ 101.36 MS; 87.10 KM/H @ 79.68 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS ACCELERATION



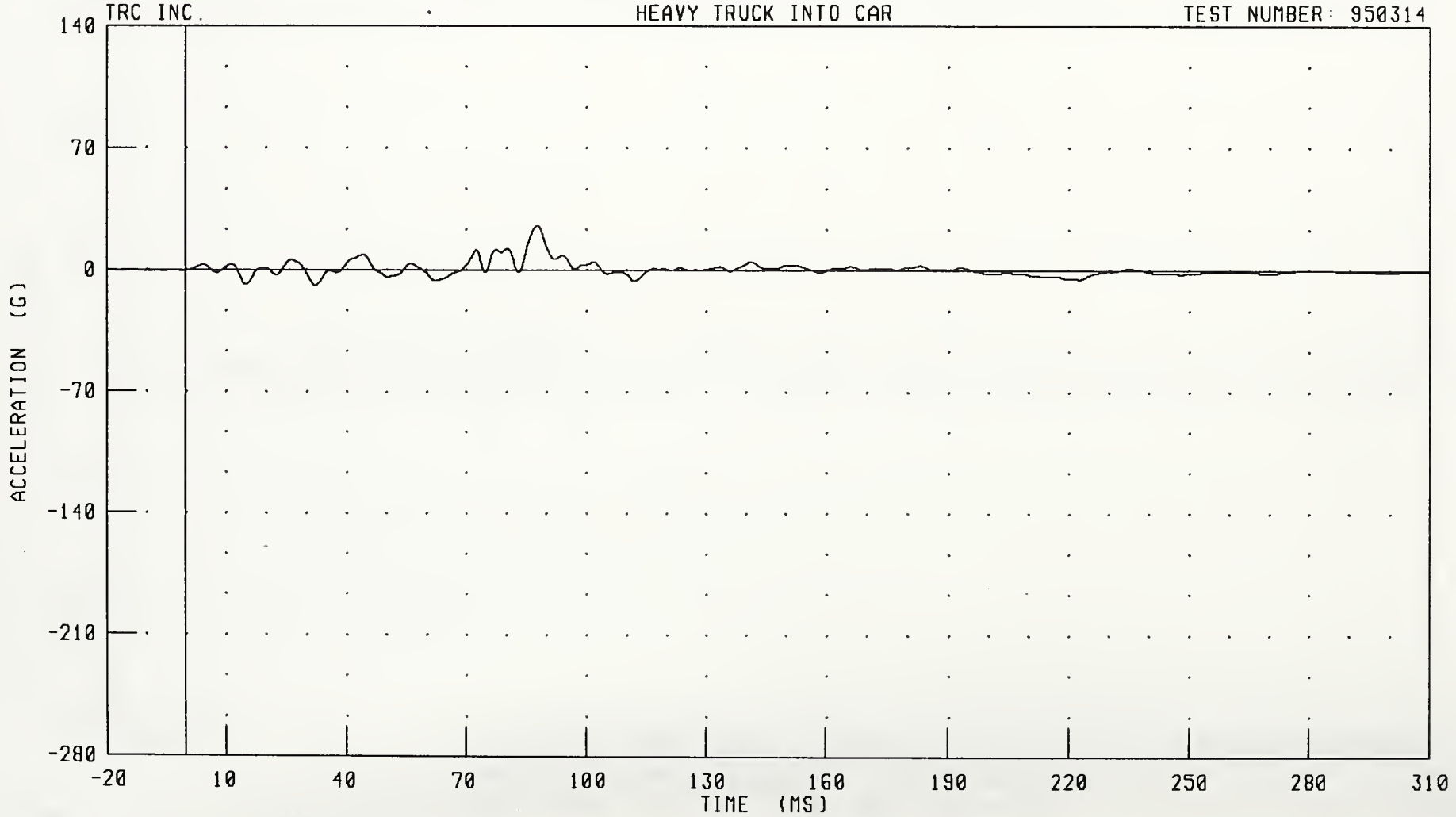
CHANNEL: FFCYG1 FILTER: CH. CLASS 60 PEAK DATA: 11.51 G @ 135.12 MS; -17.36 G @ 74.16 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Y-AXIS VELOCITY



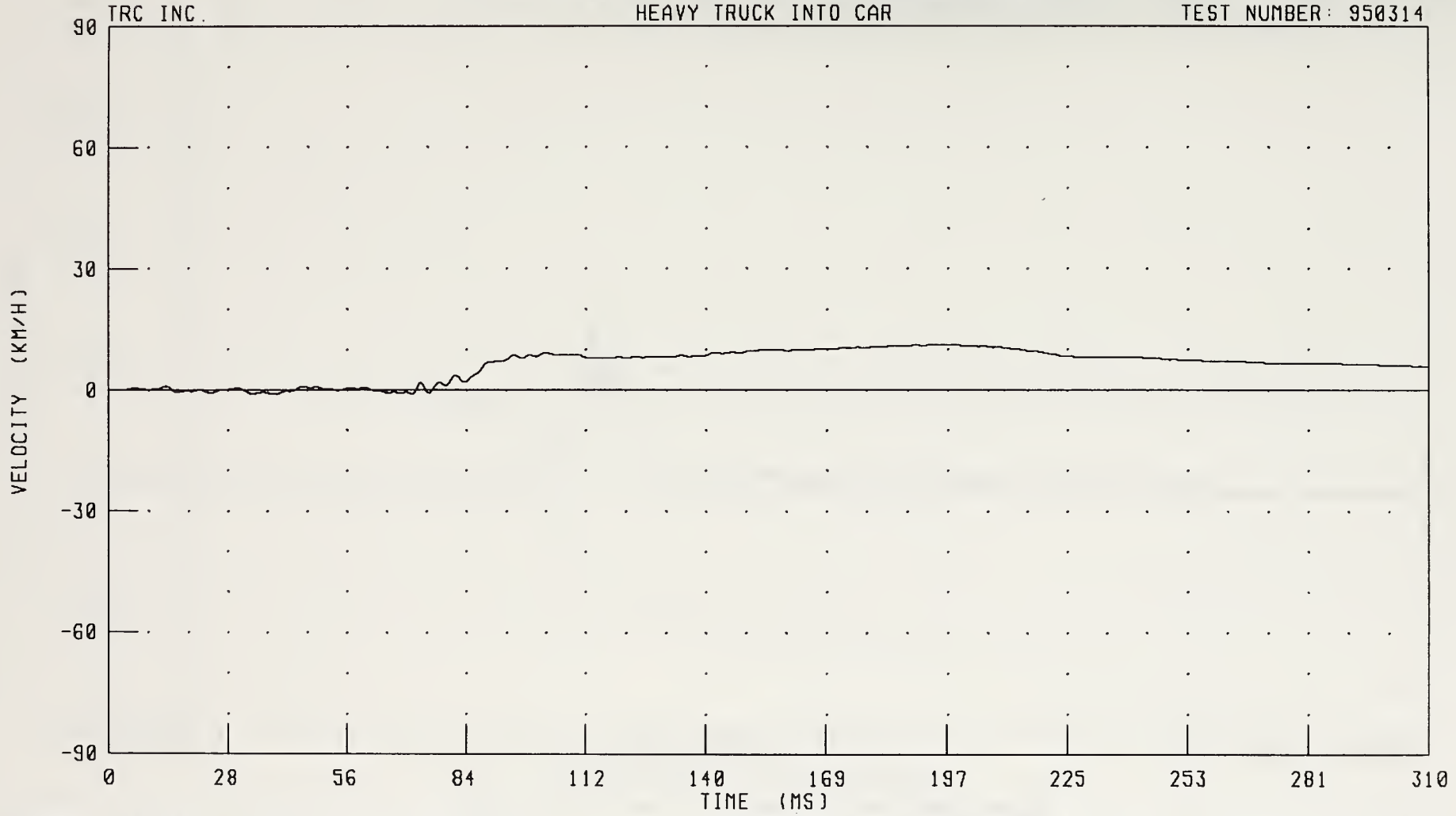
CHANNEL: FFCYV1 FILTER: CH. CLASS 180 PEAK DATA: 0.50 KM/H @ 17.76 MS; -9.09 KM/H @ 112.96 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS ACCELERATION



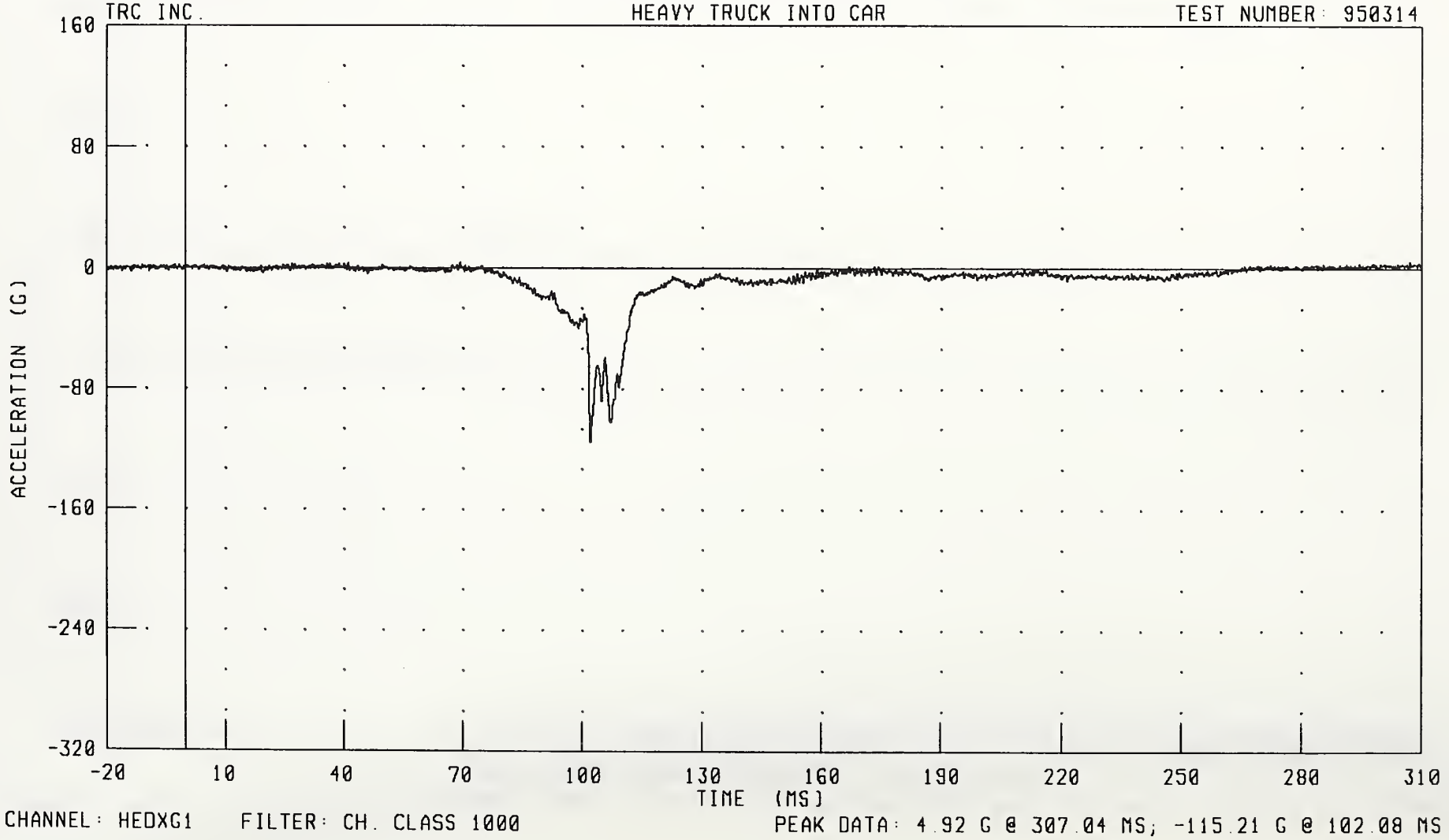
CHANNEL: FFCZG1 FILTER: CH. CLASS 60 PEAK DATA: 25.61 G @ 87.84 MS; -8.96 G @ 32.32 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER Z-AXIS VELOCITY



CHANNEL: FFCZV1 FILTER: CH. CLASS 180 PEAK DATA: 11.29 KM/H @ 195.20 MS; -1.10 KM/H @ 71.84 MS

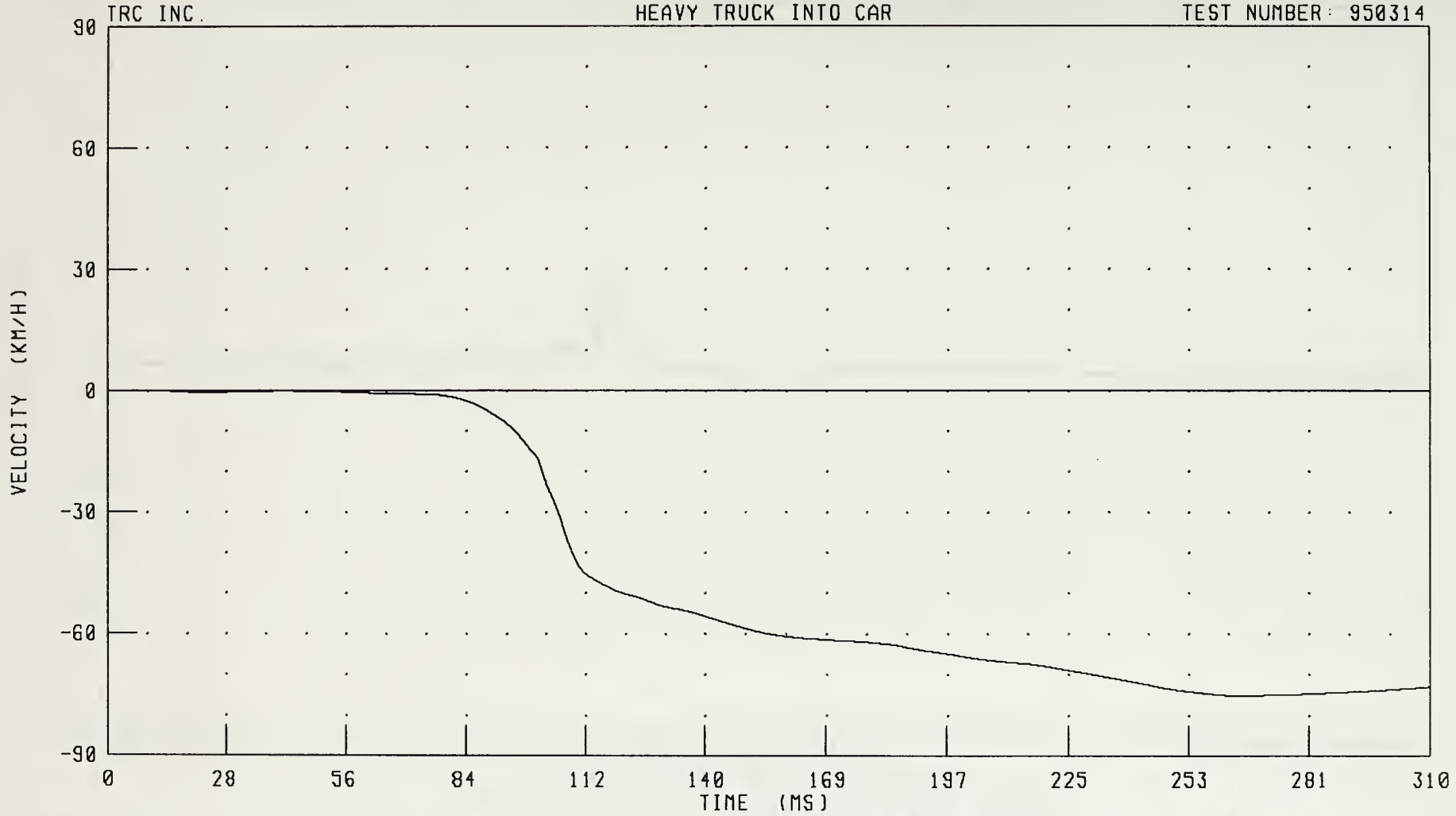
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD X-AXIS ACCELERATION



CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

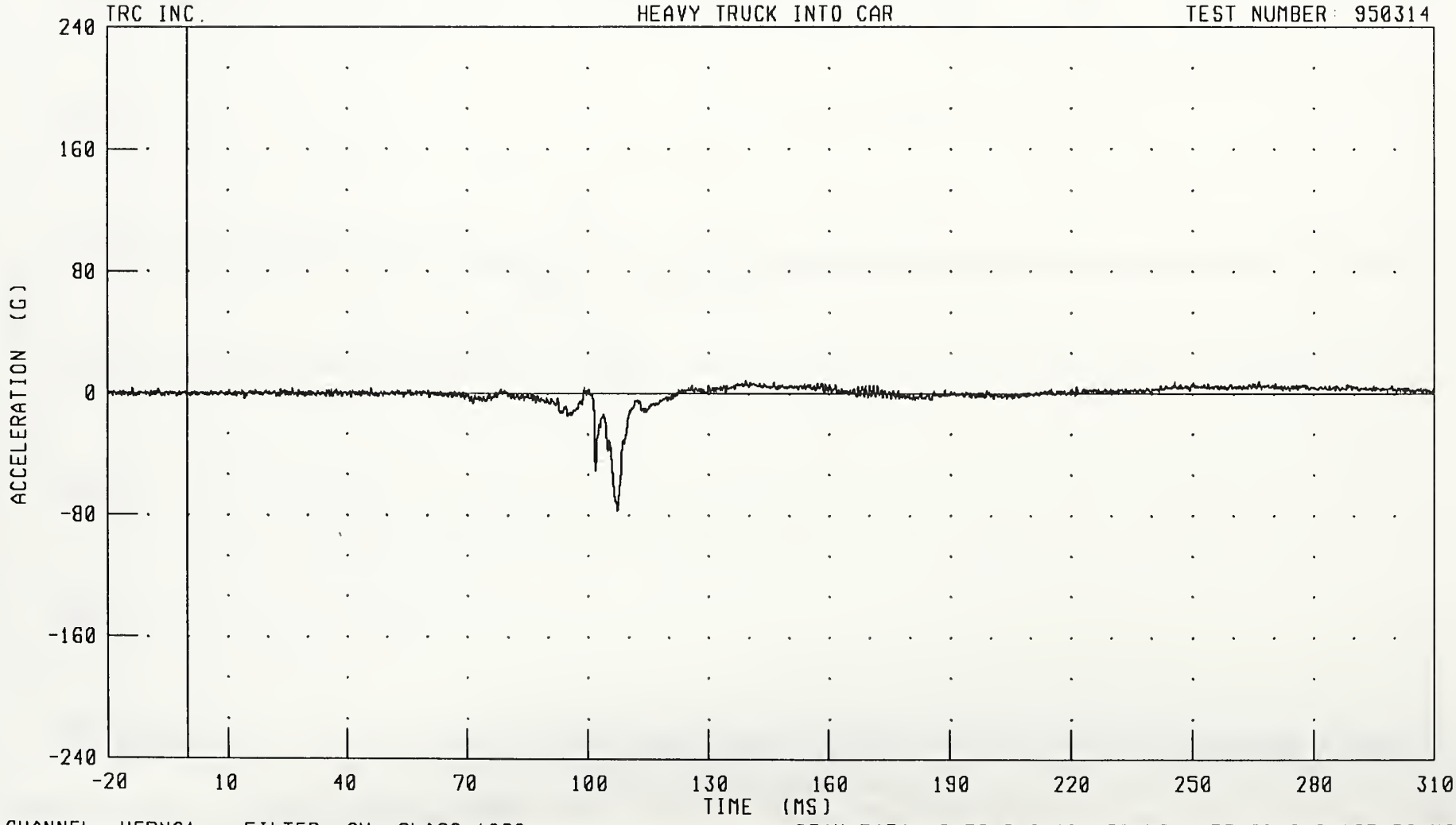
PEAK DATA: 4.92 G @ 307.04 MS; -115.21 G @ 102.08 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD X-AXIS VELOCITY



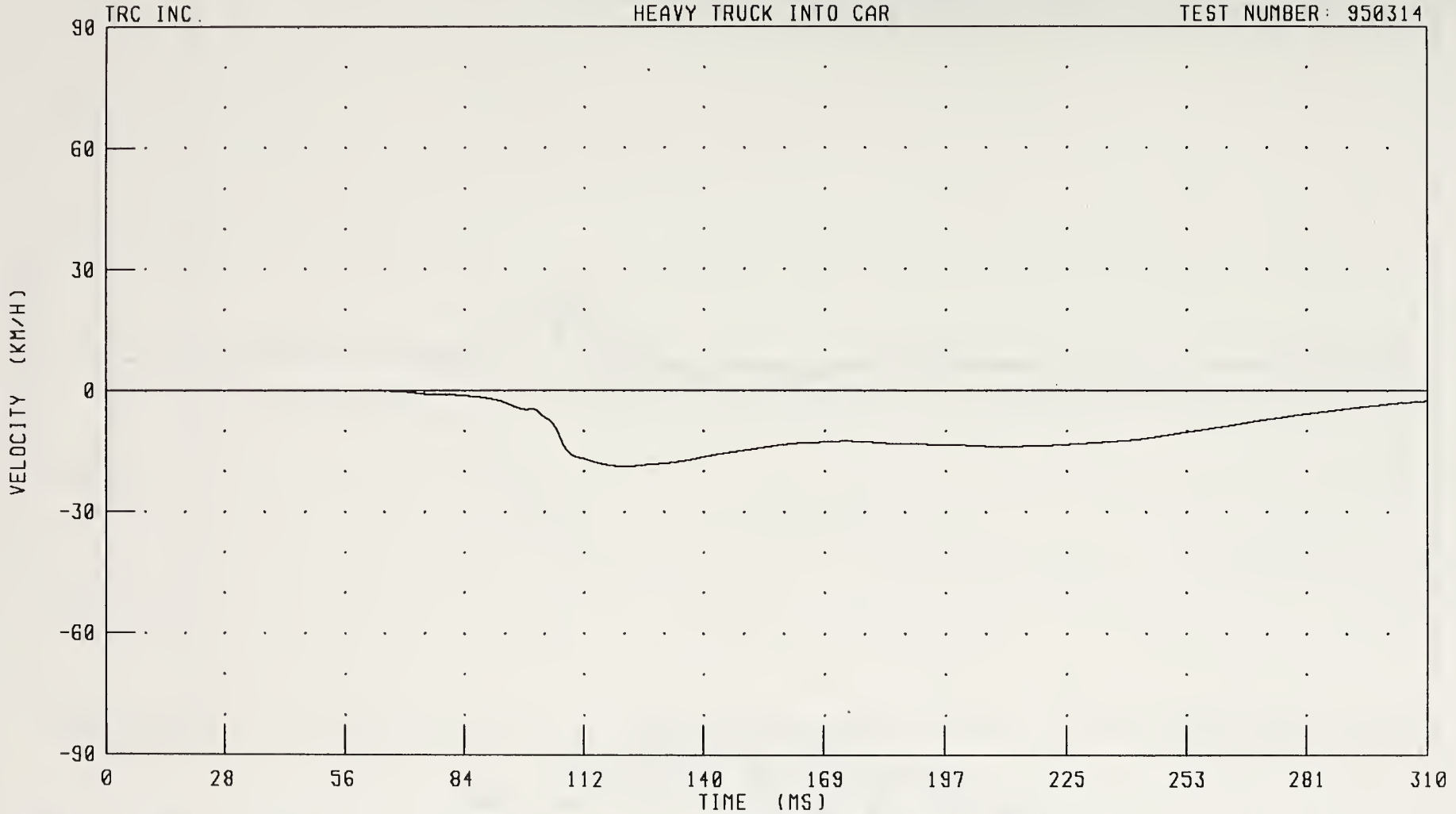
CHANNEL: HEDXV1 FILTER: CH. CLASS 180 PEAK DATA: 0.07 KM/H @ 7.36 MS; -75.14 KM/H @ 266.48 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD Y-AXIS ACCELERATION



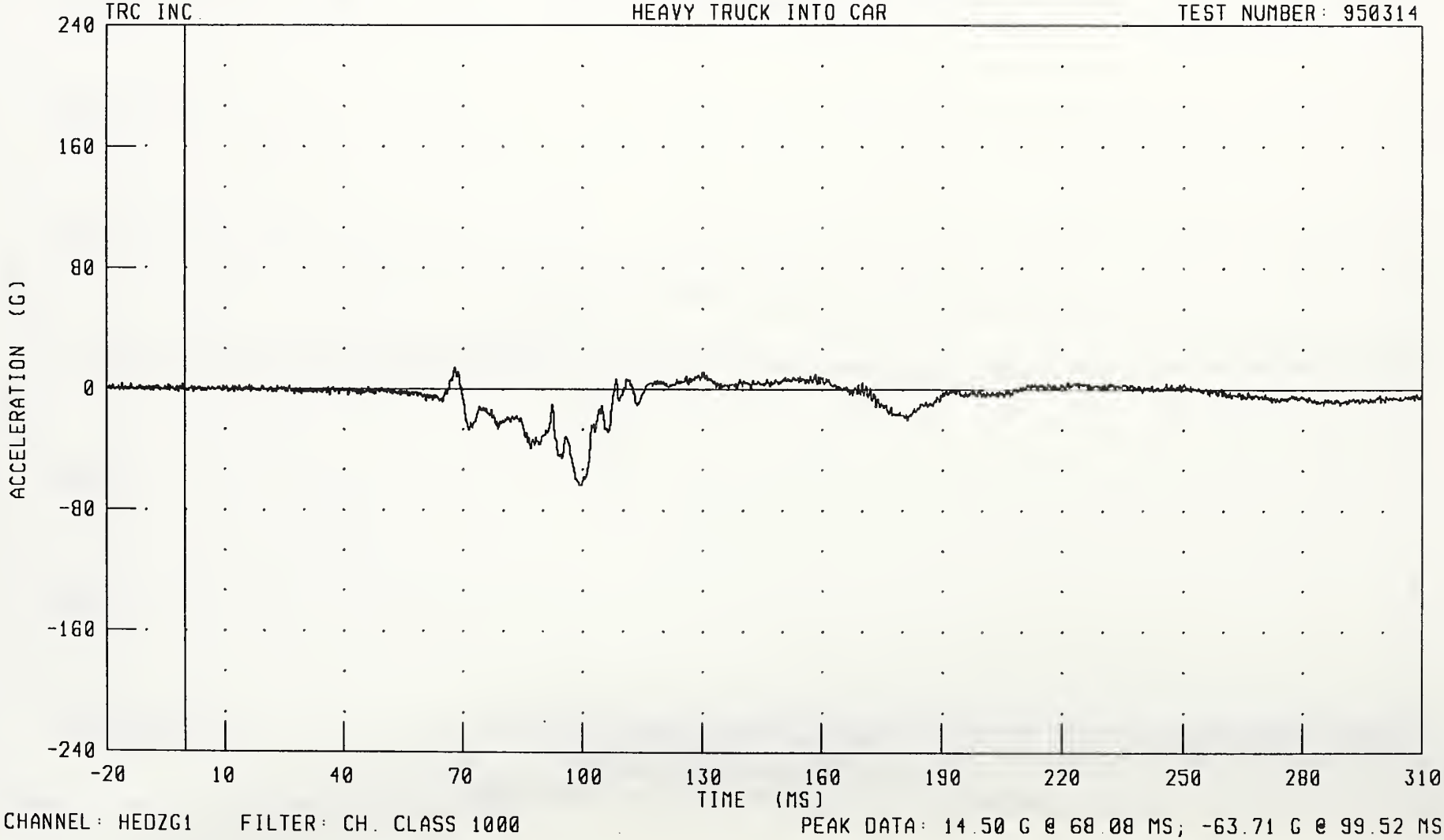
CHANNEL: HEDYG1 FILTER: CH. CLASS 1000 PEAK DATA: 8.58 G @ 139.36 MS; -77.03 G @ 107.36 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD Y-AXIS VELOCITY



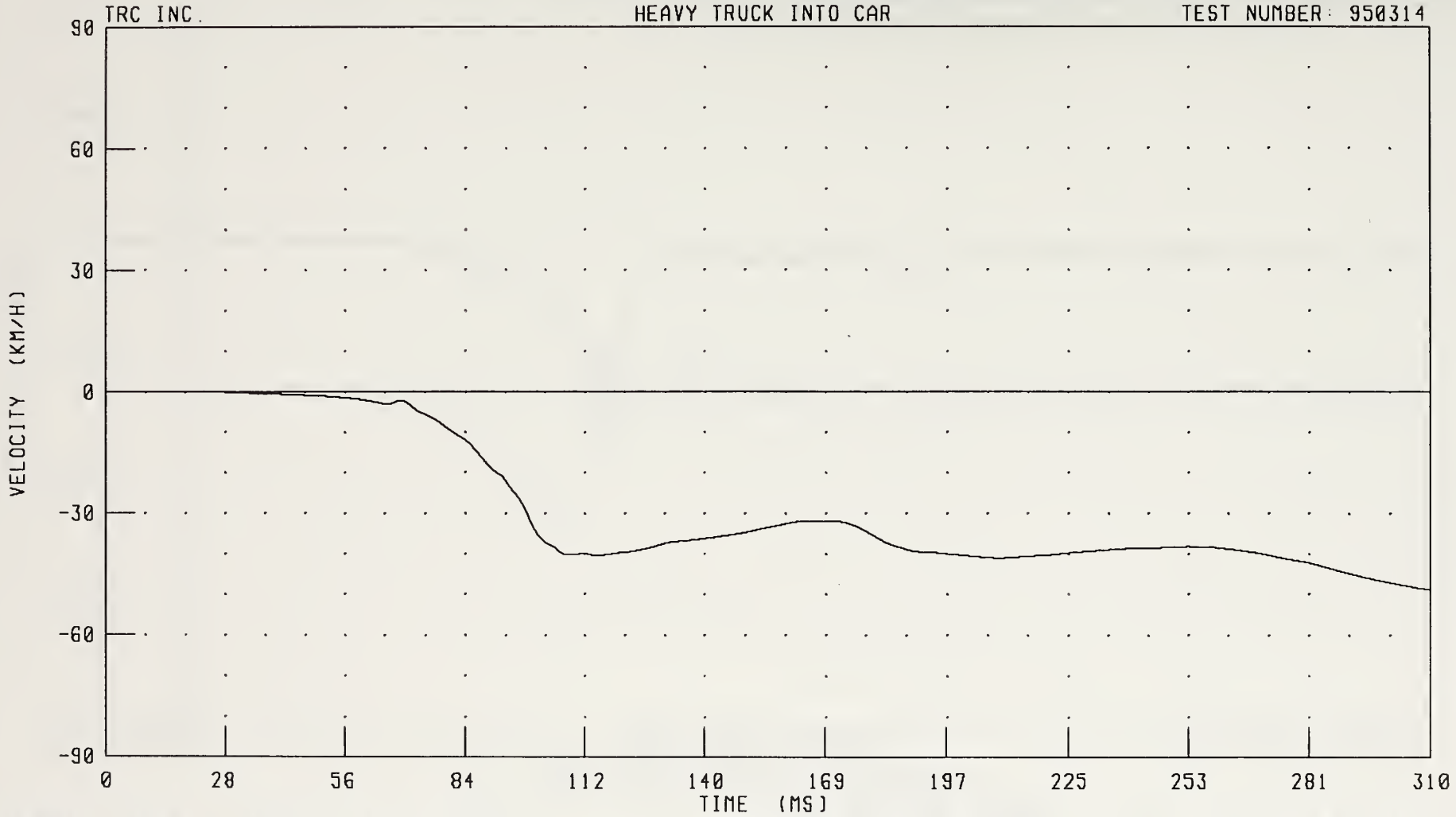
CHANNEL: HEDYV1 FILTER: CH. CLASS 180 PEAK DATA: 0.00 KM/H @ 27.04 MS; -18.81 KM/H @ 122.16 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD Z-AXIS ACCELERATION



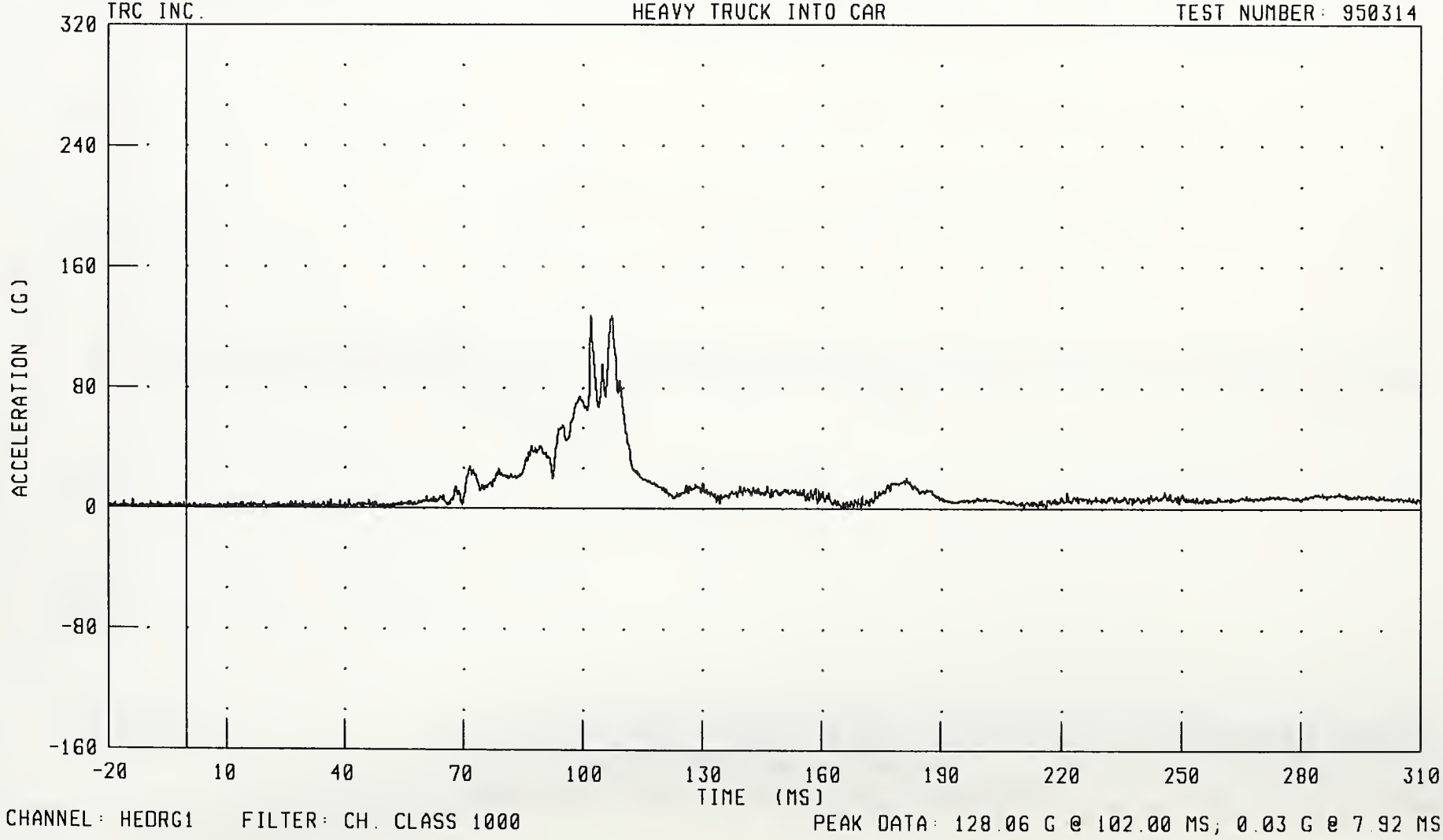
CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 14.50 G @ 68.08 MS; -63.71 G @ 99.52 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD Z-AXIS VELOCITY



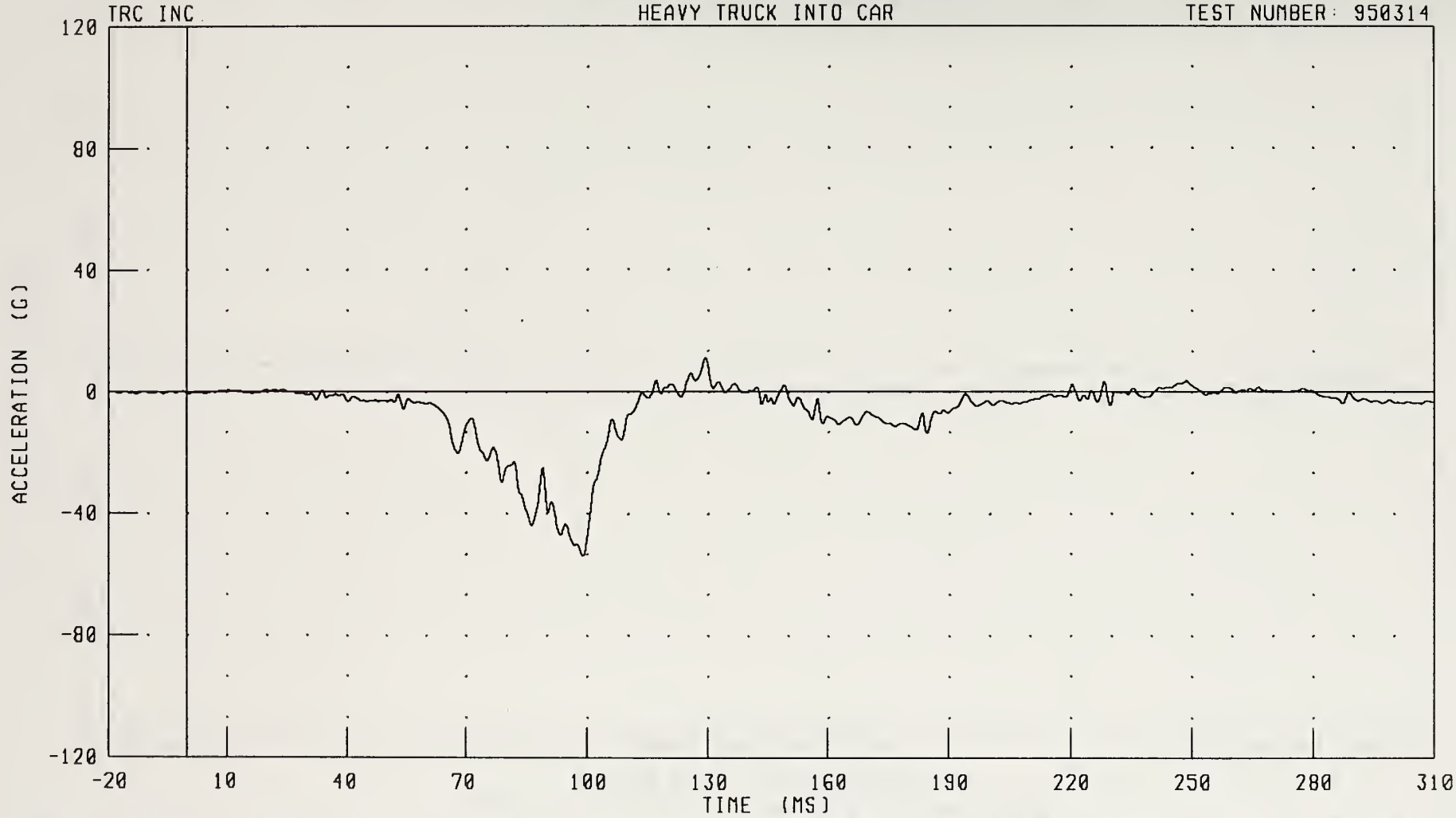
CHANNEL: HEDZV1 FILTER: CH CLASS 180 PEAK DATA: 0.02 KM/H @ 17.36 MS; -48.86 KM/H @ 310.00 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER HEAD RESULTANT ACCELERATION



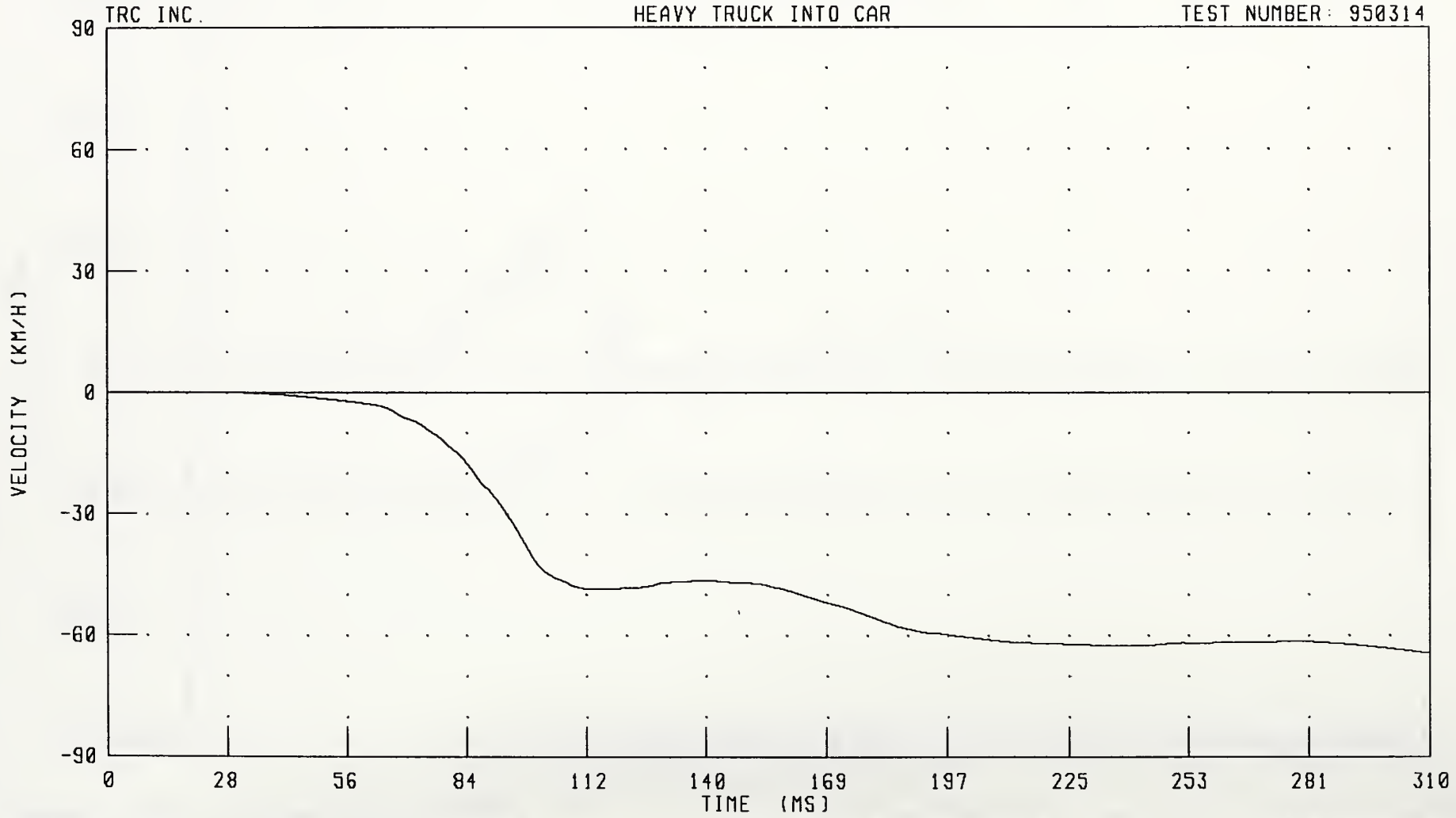
CHANNEL: HEDRG1 FILTER: CH. CLASS 1000 PEAK DATA: 128.06 G @ 102.00 MS; 0.03 G @ 7.92 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST X-AXIS ACCELERATION

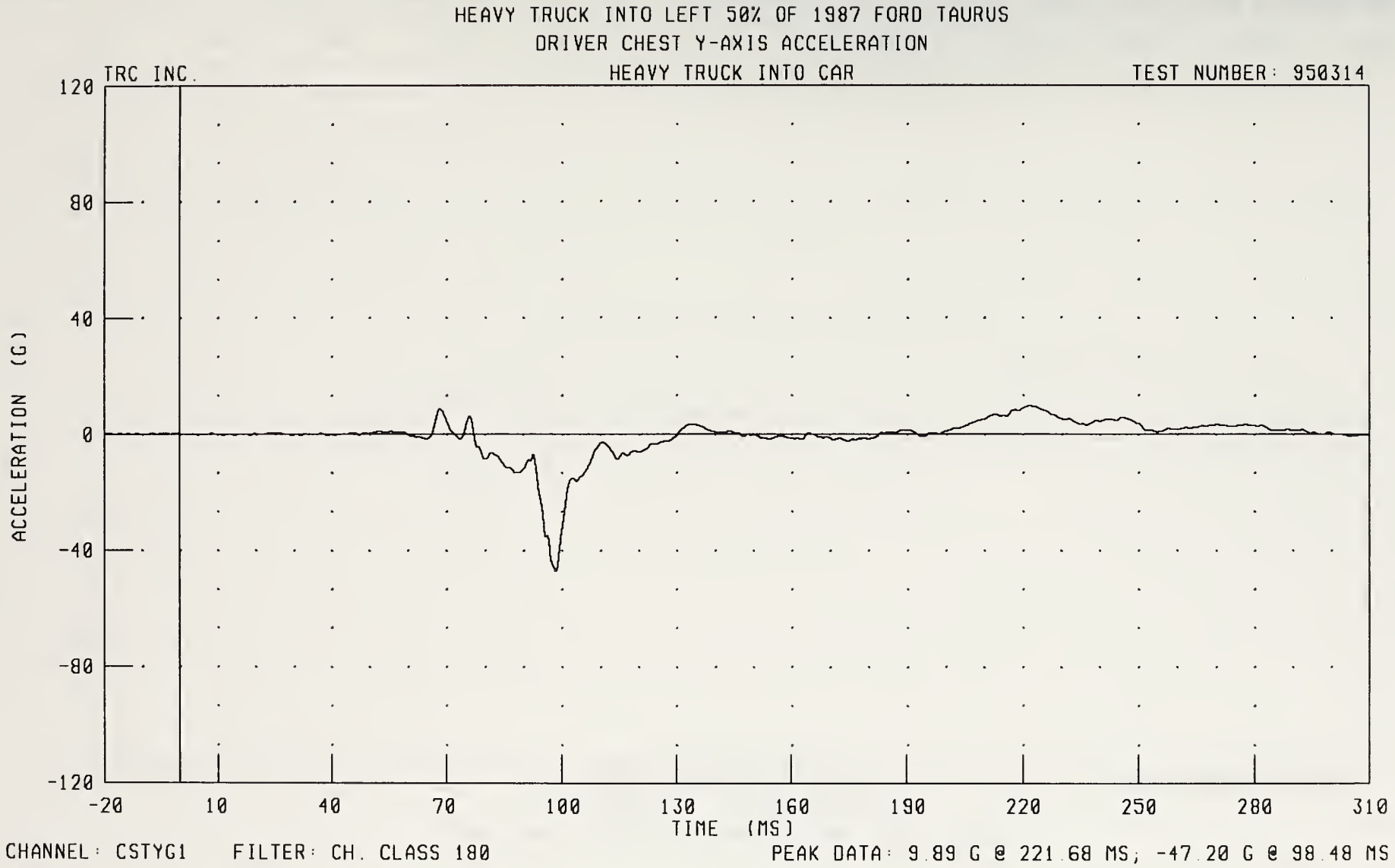


CHANNEL: CSTXG1 FILTER: CH. CLASS 180 PEAK DATA: 11.31 G @ 129.36 MS; -53.92 G @ 99.04 MS

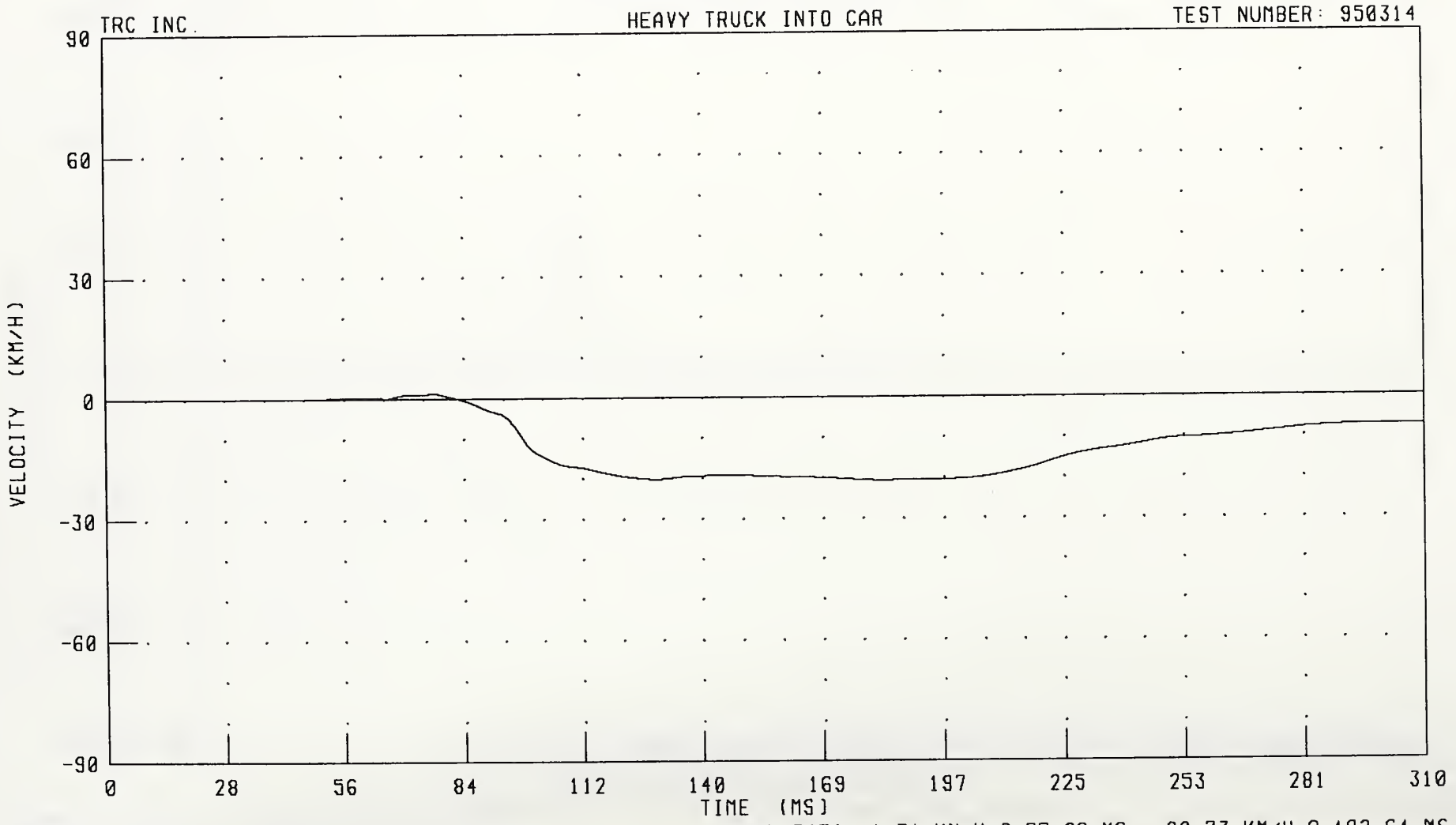
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST X-AXIS VELOCITY



CHANNEL: CSTXV1 FILTER: CH. CLASS 180 PEAK DATA: 0.05 KM/H @ 26.72 MS; -64.35 KM/H @ 310.00 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST Y-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
120
80
40
0
-40
-80
-120
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: CSTYG1
FILTER: CH. CLASS 180
PEAK DATA: 9.89 G @ 221.68 MS; -47.20 G @ 98.48 MS

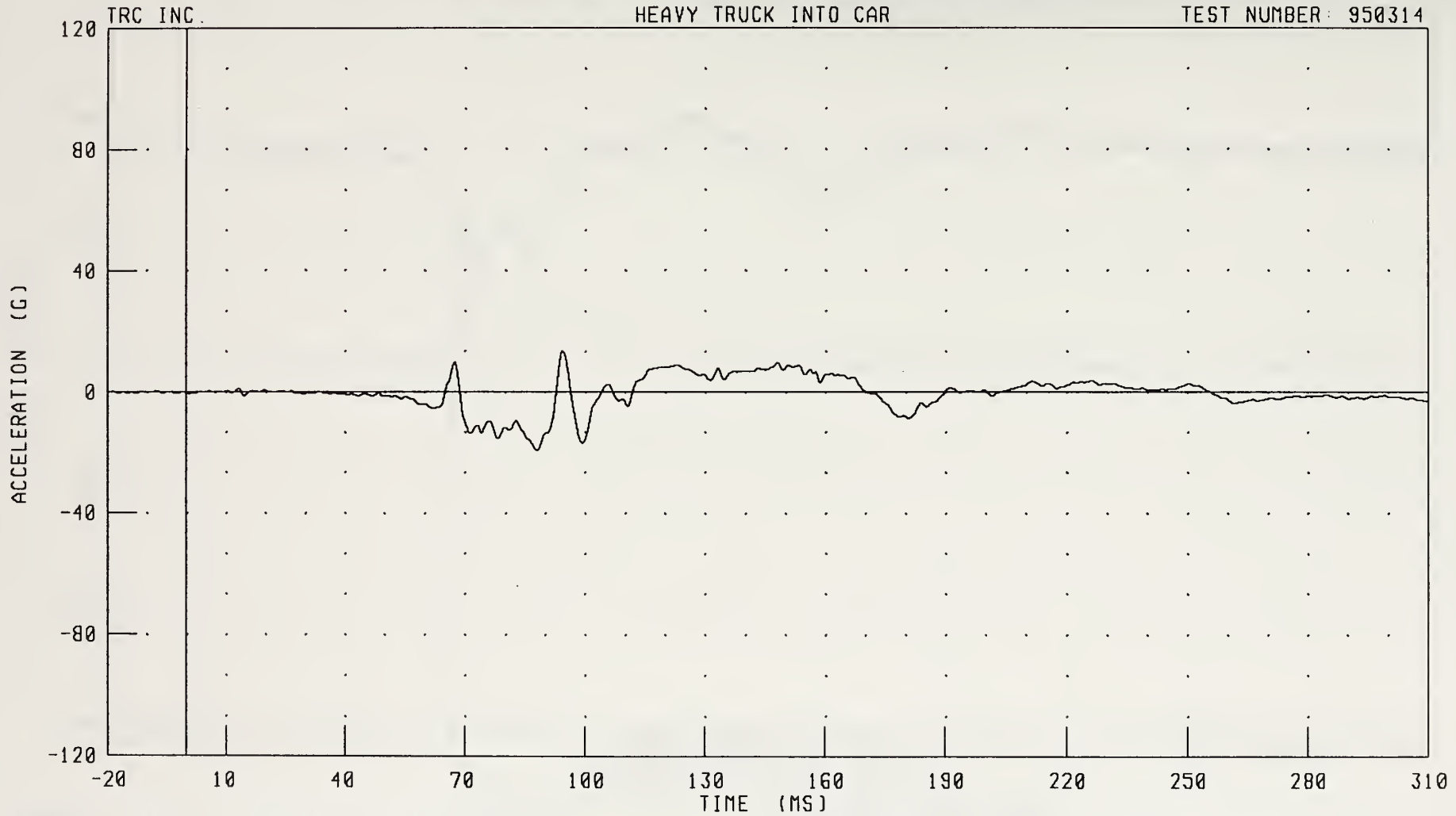
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST Y-AXIS VELOCITY



CHANNEL: CSTYV1 FILTER: CH. CLASS 180

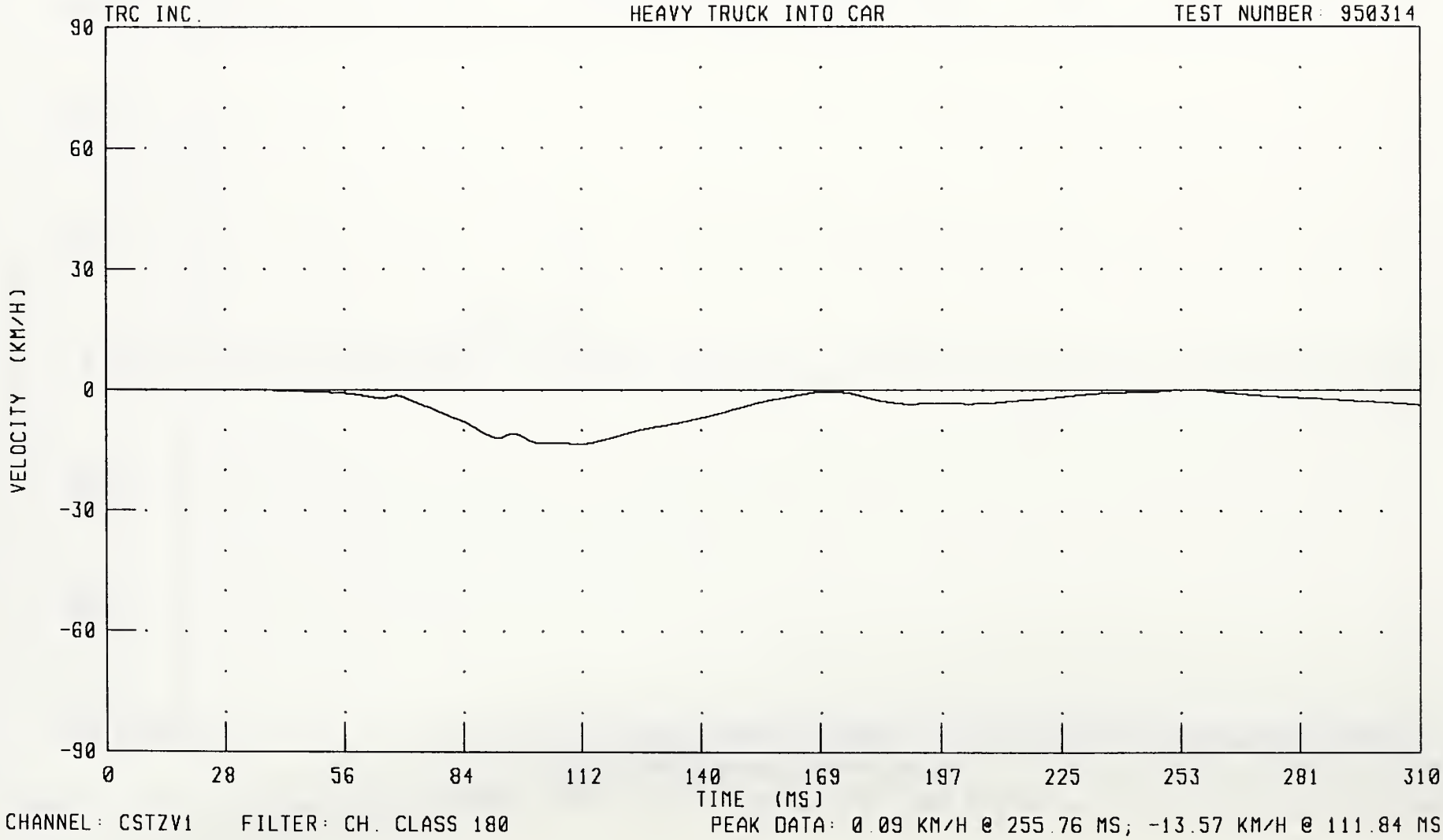
PEAK DATA: 1.31 KM/H @ 77.20 MS; -20.73 KM/H @ 182.64 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST Z-AXIS ACCELERATION

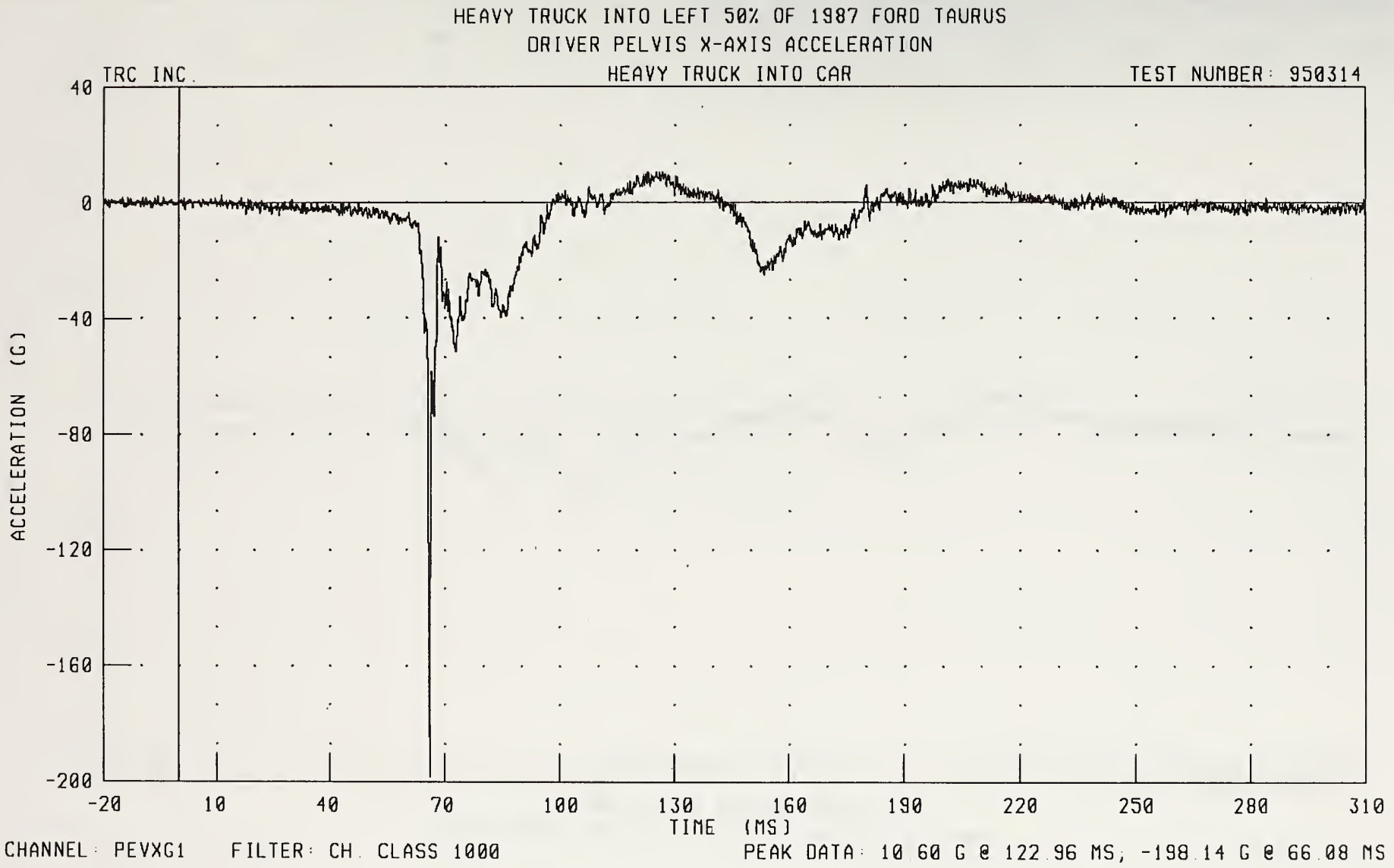


CHANNEL: CSTZG1 FILTER: CH. CLASS 180 PEAK DATA: 13.44 G @ 94.32 MS; -19.44 G @ 88.00 MS

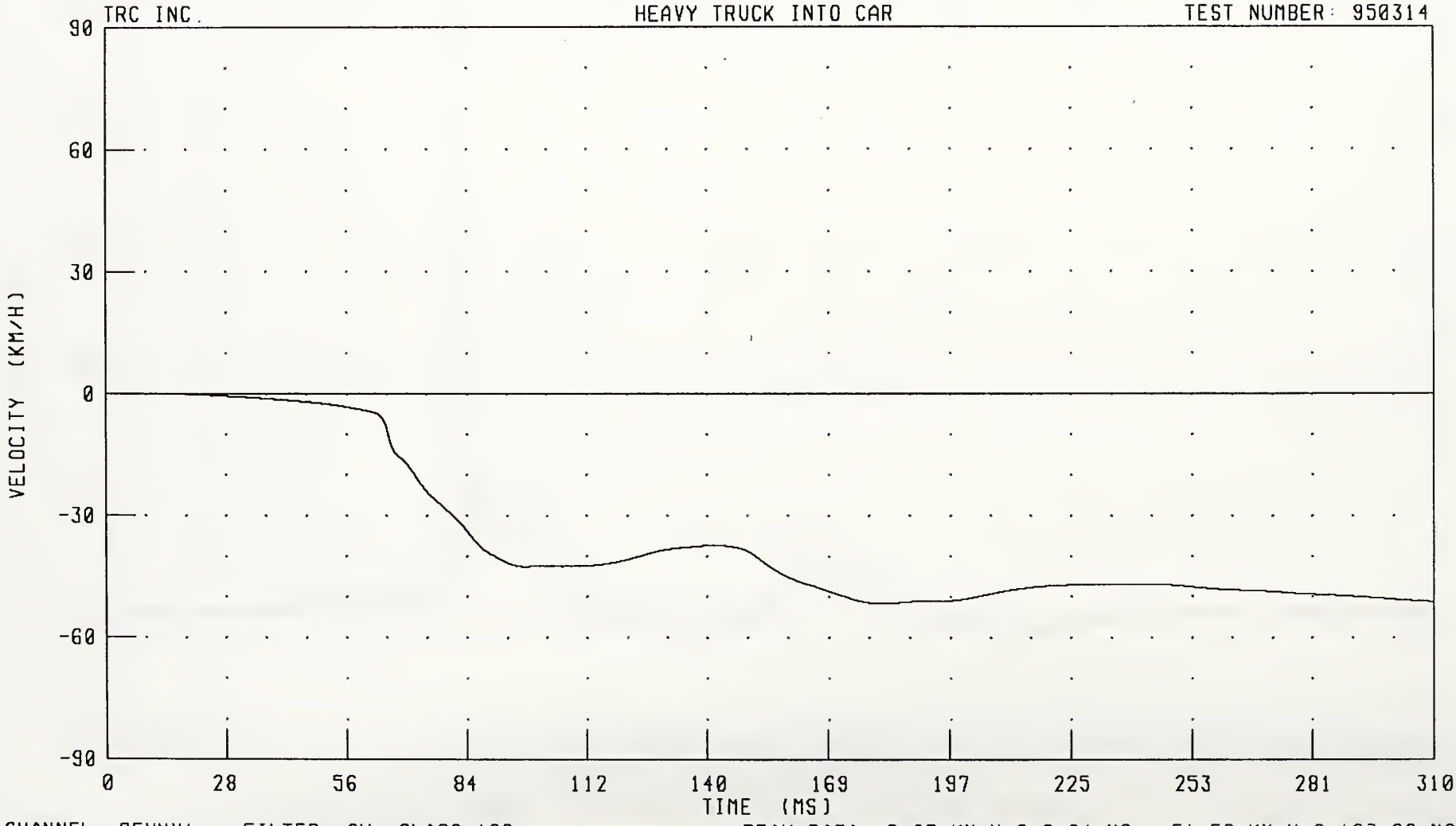
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST Z-AXIS VELOCITY



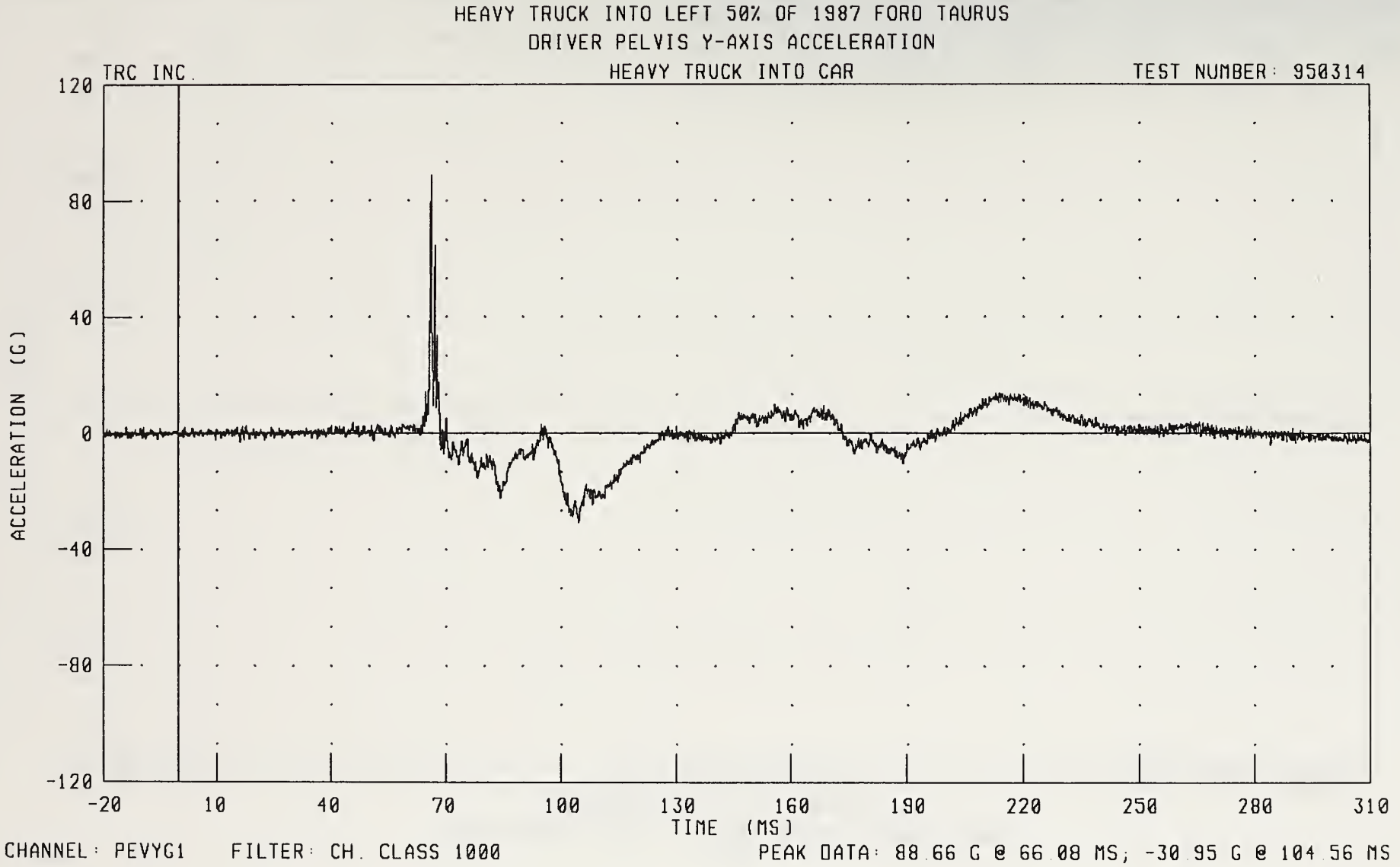
CHANNEL: CSTZV1 FILTER: CH. CLASS 180 PEAK DATA: 0.09 KM/H @ 255.76 MS; -13.57 KM/H @ 111.84 MS


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS X-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
40
0
-40
-80
-120
-160
-200
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVXG1
FILTER: CH. CLASS 1000
PEAK DATA: 10.60 G @ 122.96 MS, -198.14 G @ 66.08 MS

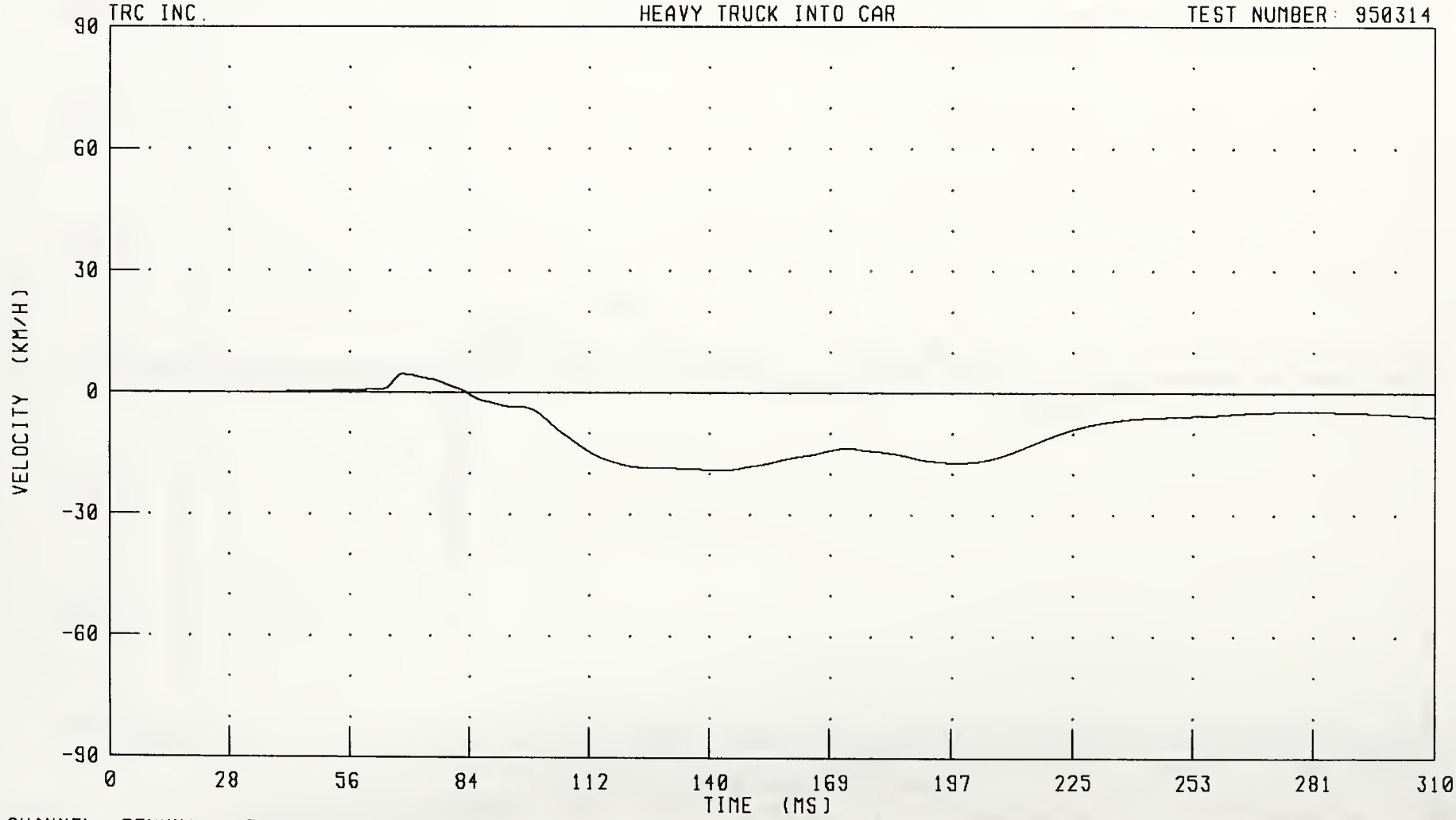
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS X-AXIS VELOCITY



CHANNEL: PEVXV1 FILTER: CH. CLASS 180 PEAK DATA: 0.03 KM/H @ 9.84 MS; -51.56 KM/H @ 183.28 MS

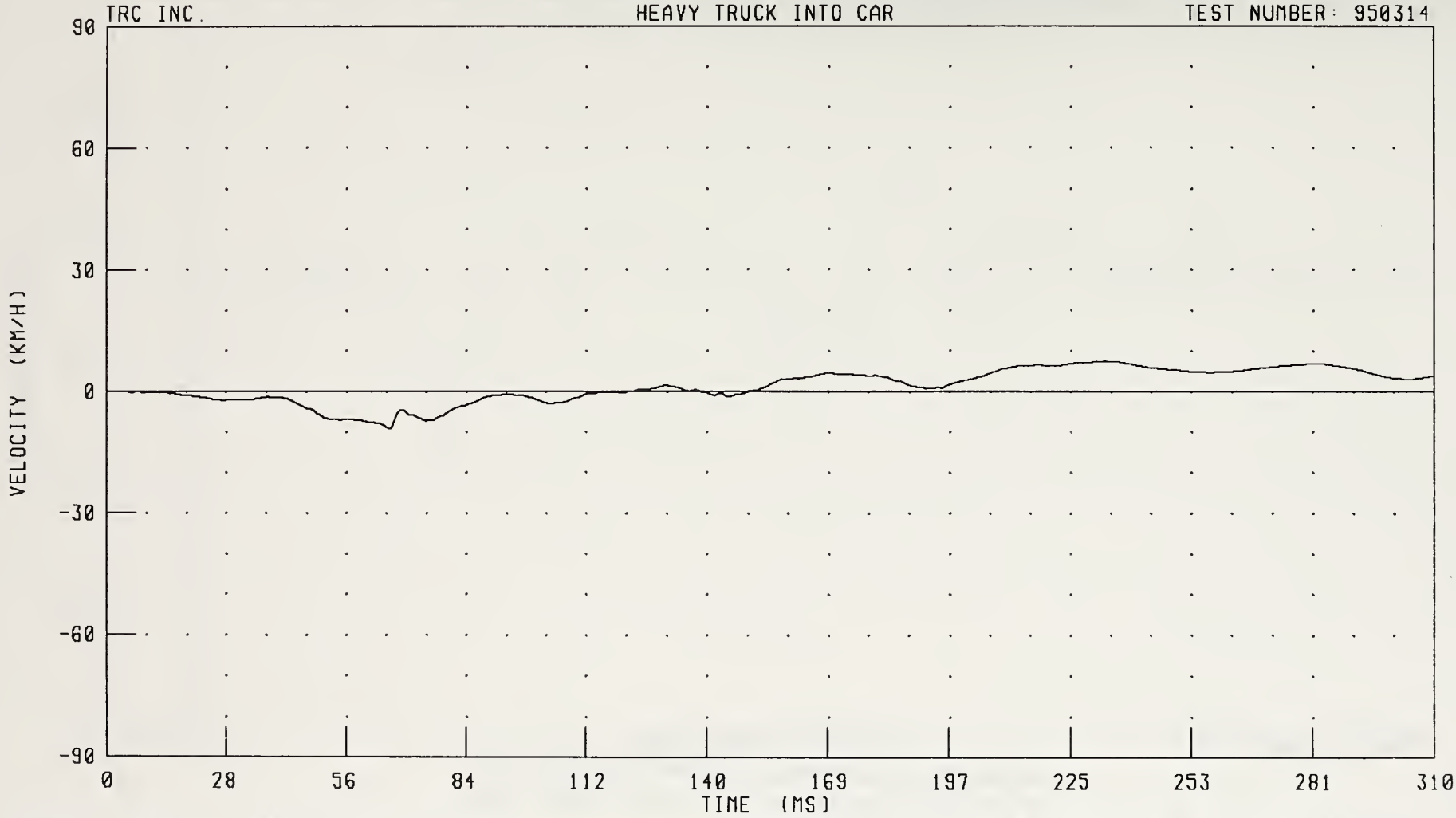

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS Y-AXIS ACCELERATION
TRC INC.
HEAVY TRUCK INTO CAR
TEST NUMBER: 950314
120
80
40
0
-40
-80
-120
ACCELERATION (G)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: PEVYG1
FILTER: CH. CLASS 1000
PEAK DATA: 88.66 G @ 66.08 MS; -30.95 G @ 104.56 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS Y-AXIS VELOCITY



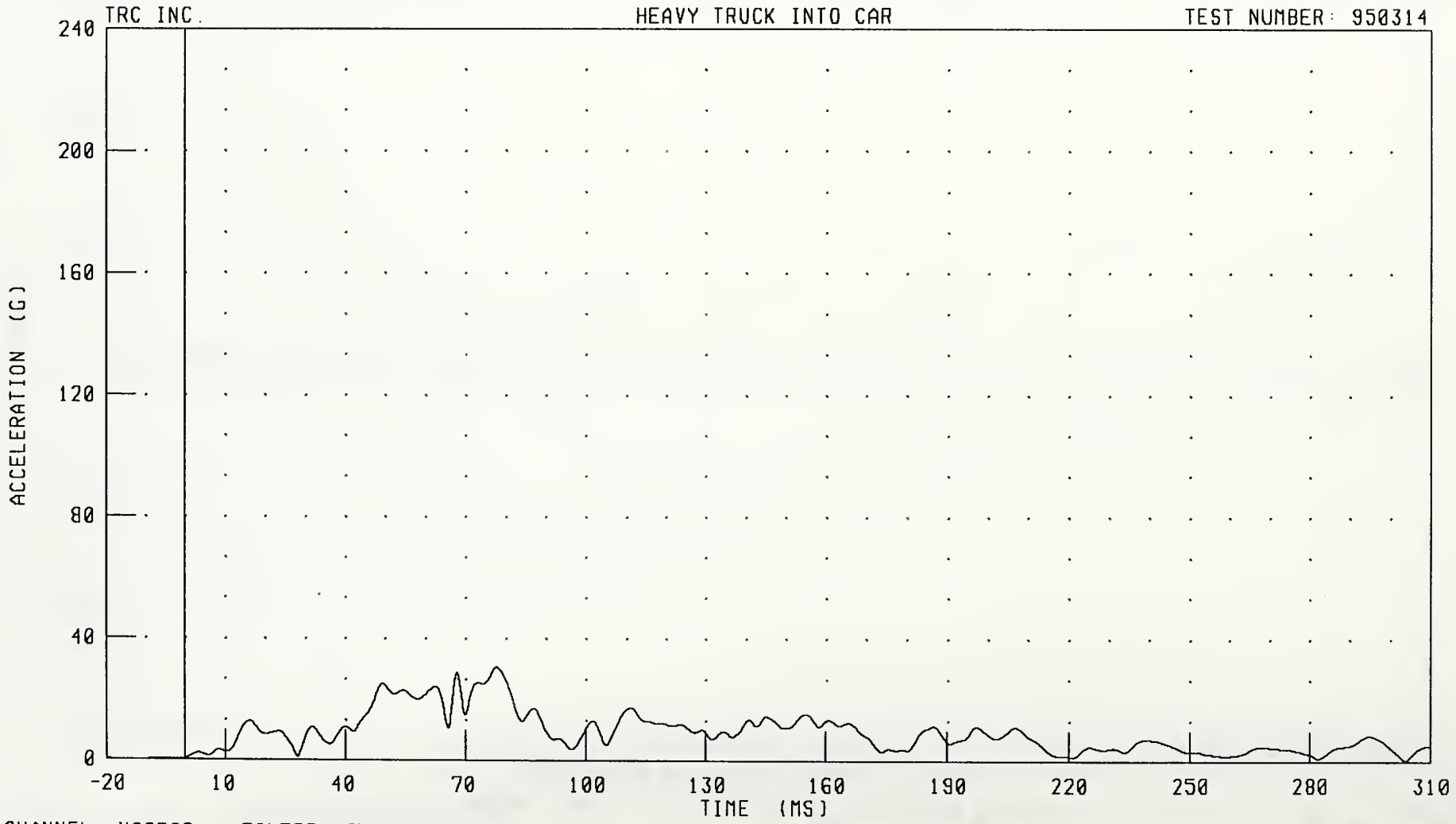
CHANNEL: PEVYV1 FILTER: CH. CLASS 180 PEAK DATA: 4.51 KM/H @ 68.80 MS; -19.16 KM/H @ 144.24 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY Z-AXIS VELOCITY



CHANNEL: VCGZV2 FILTER: CH. CLASS 180 PEAK DATA: 7.52 KM/H @ 233.52 MS; -9.19 KM/H @ 66.48 MS

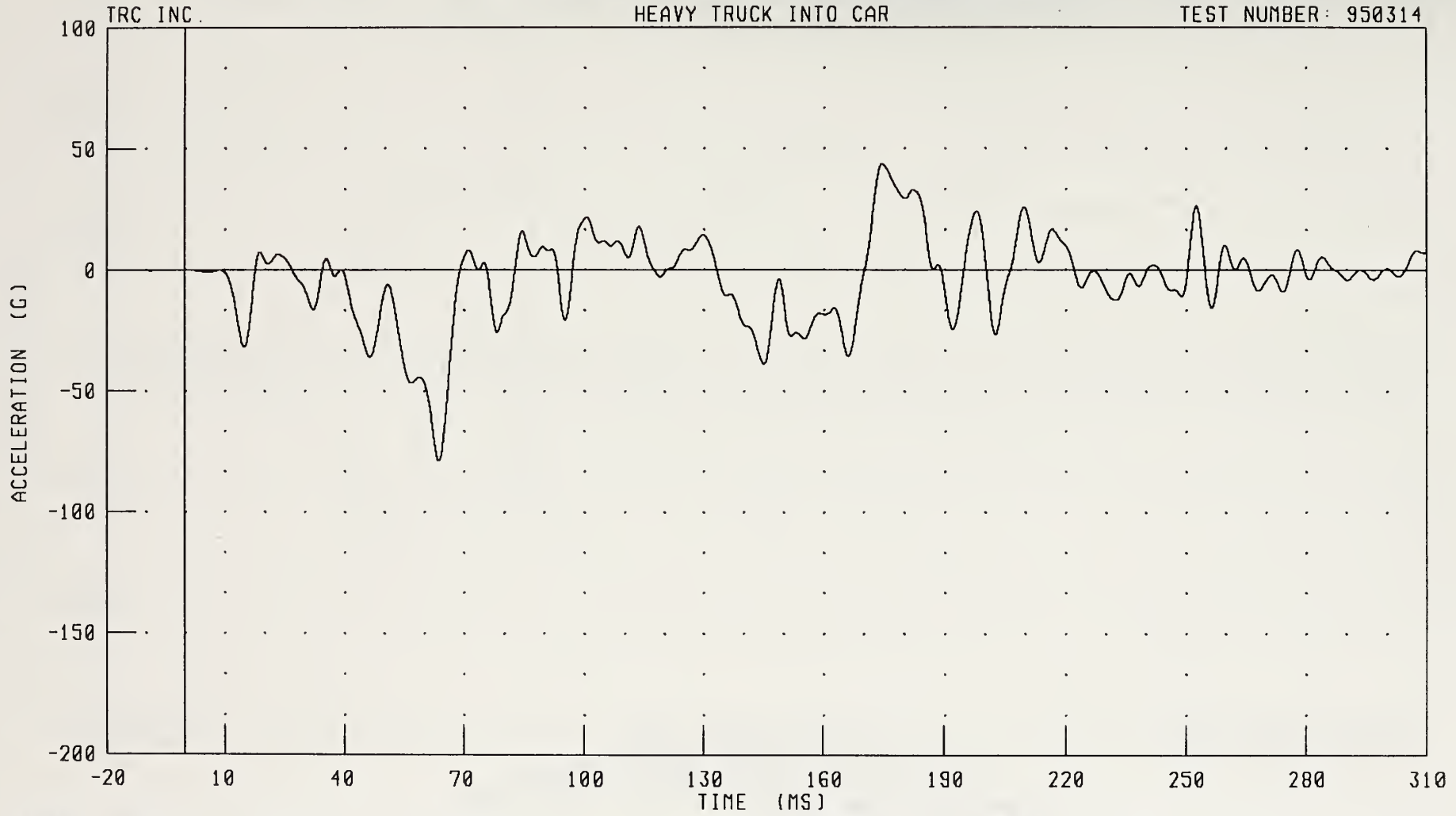
HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY RESULTANT ACCELERATION



CHANNEL: VCGRG2 FILTER: CH. CLASS 60

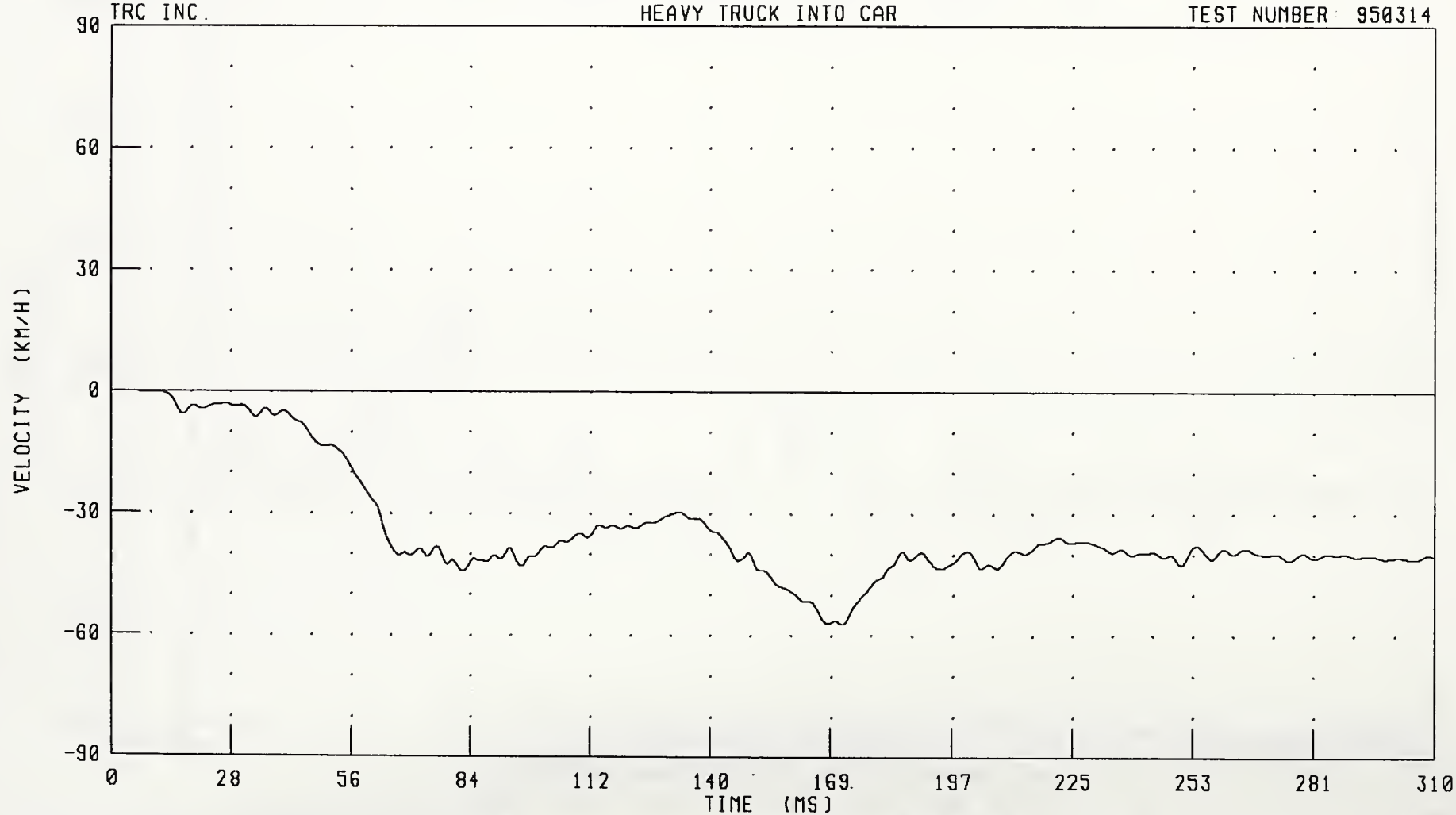
PEAK DATA: 30.86 G @ 77.68 MS; 0.15 G @ -10.96 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

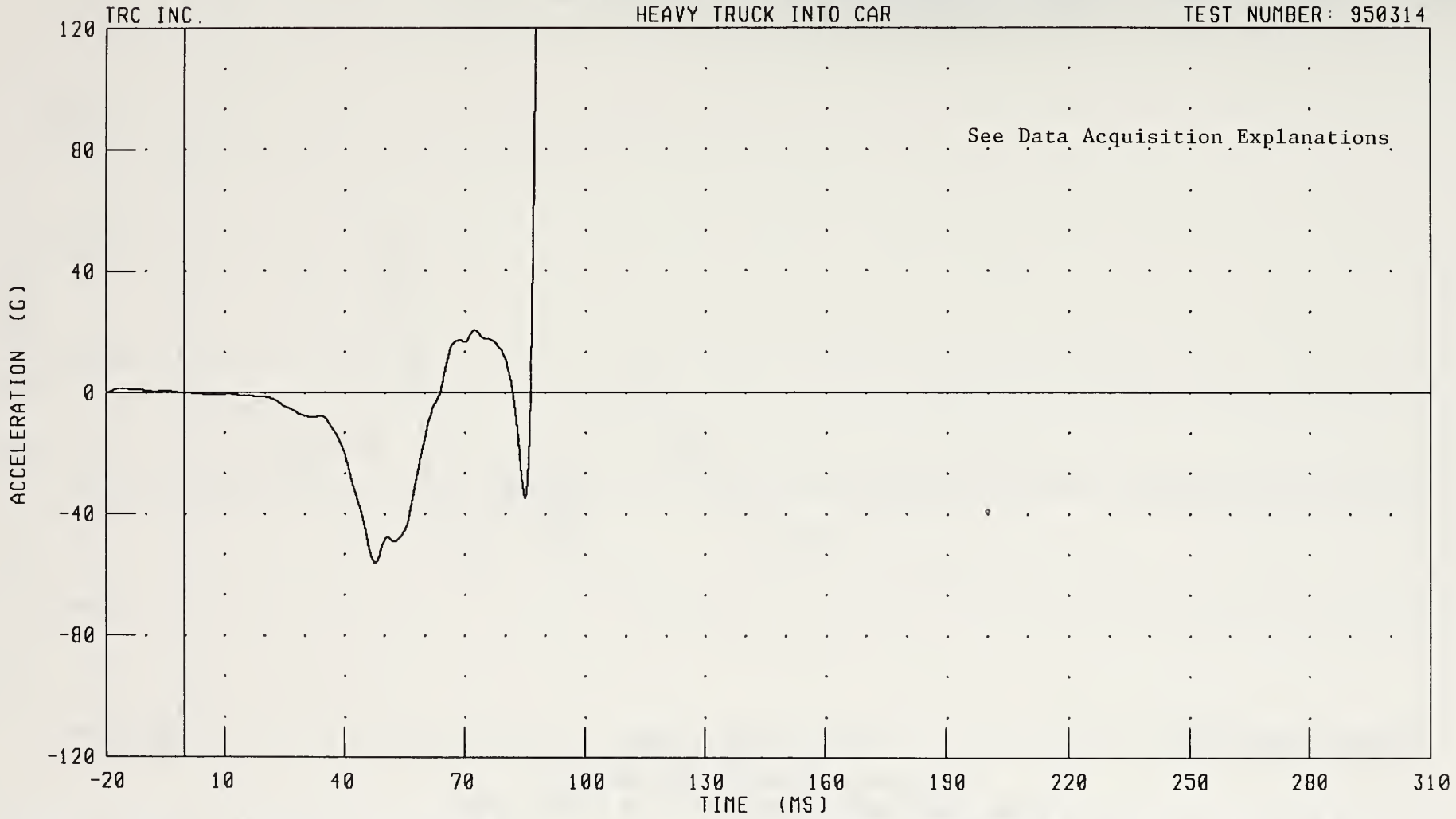


CHANNEL: DPCXG2 FILTER: CH. CLASS 60 PEAK DATA: 43.72 G @ 174.56 MS; -78.92 G @ 63.68 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
INSTRUMENT PANEL CENTER X-AXIS VELOCITY

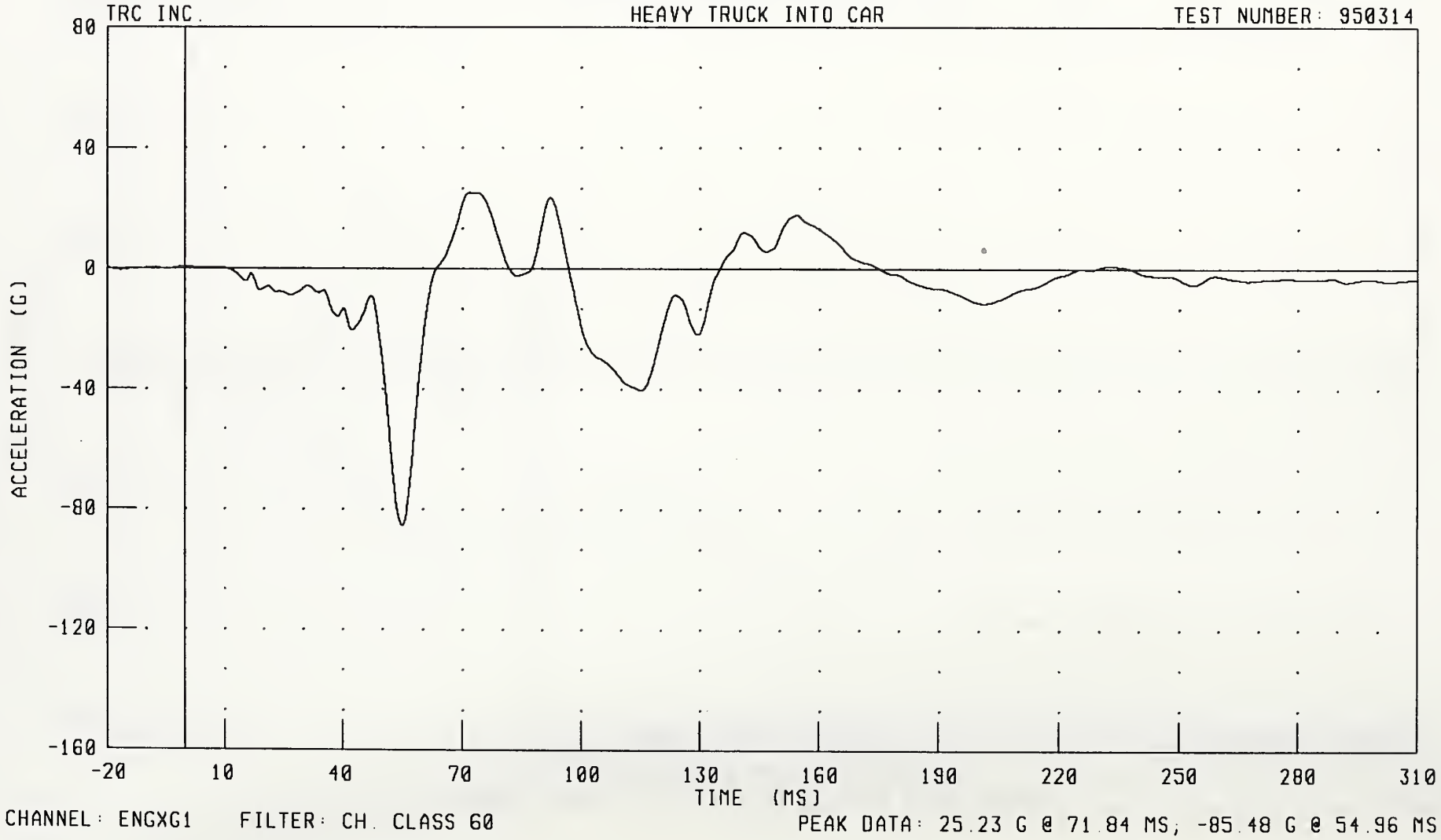


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
ENGINE BOTTOM X-AXIS ACCELERATION



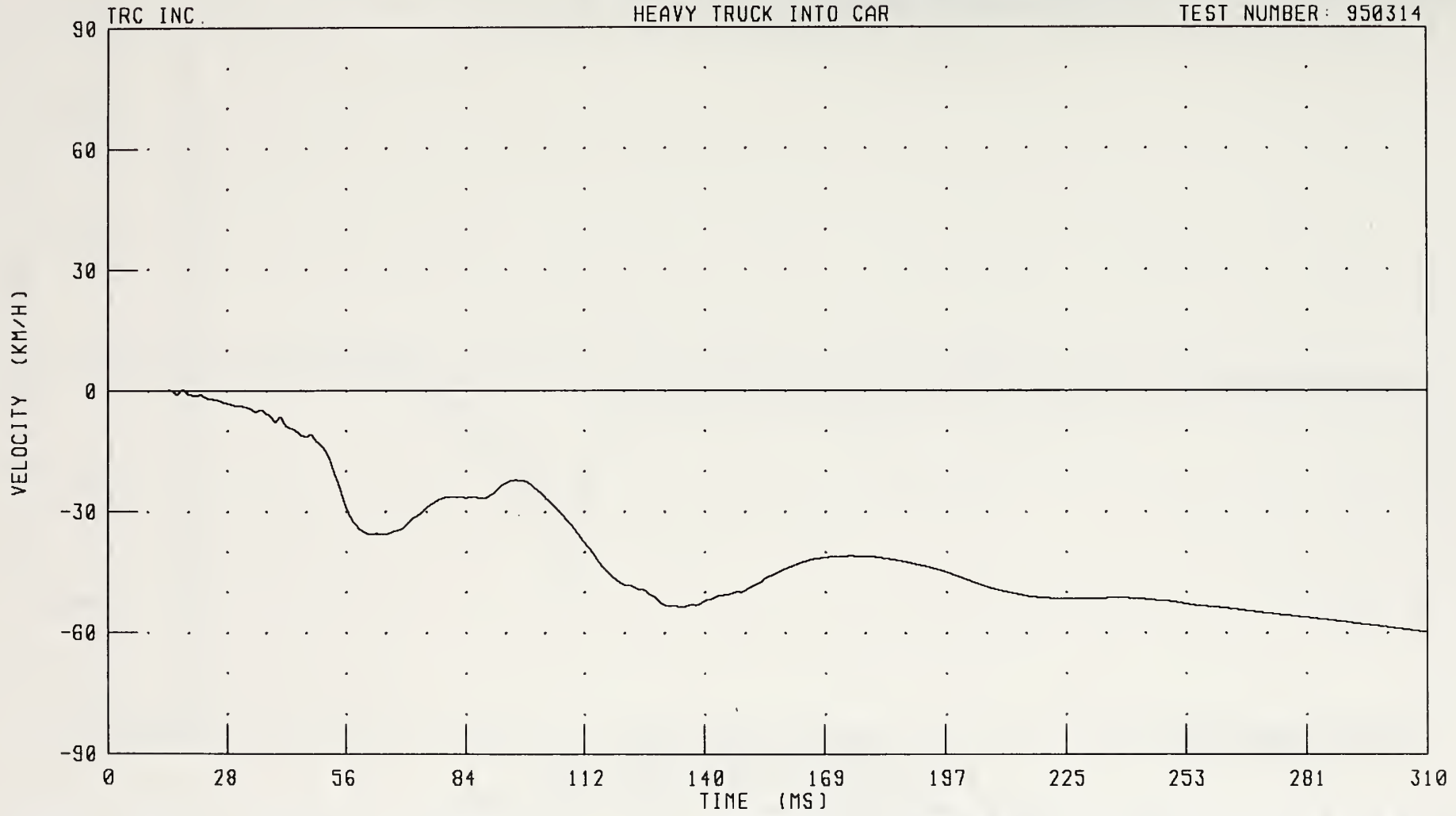
CHANNEL: ENGXG2 FILTER: CH. CLASS 60 PEAK DATA: 1051.00 G @ 93.12 MS; -56.21 G @ 47.68 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
ENGINE TOP X-AXIS ACCELERATION



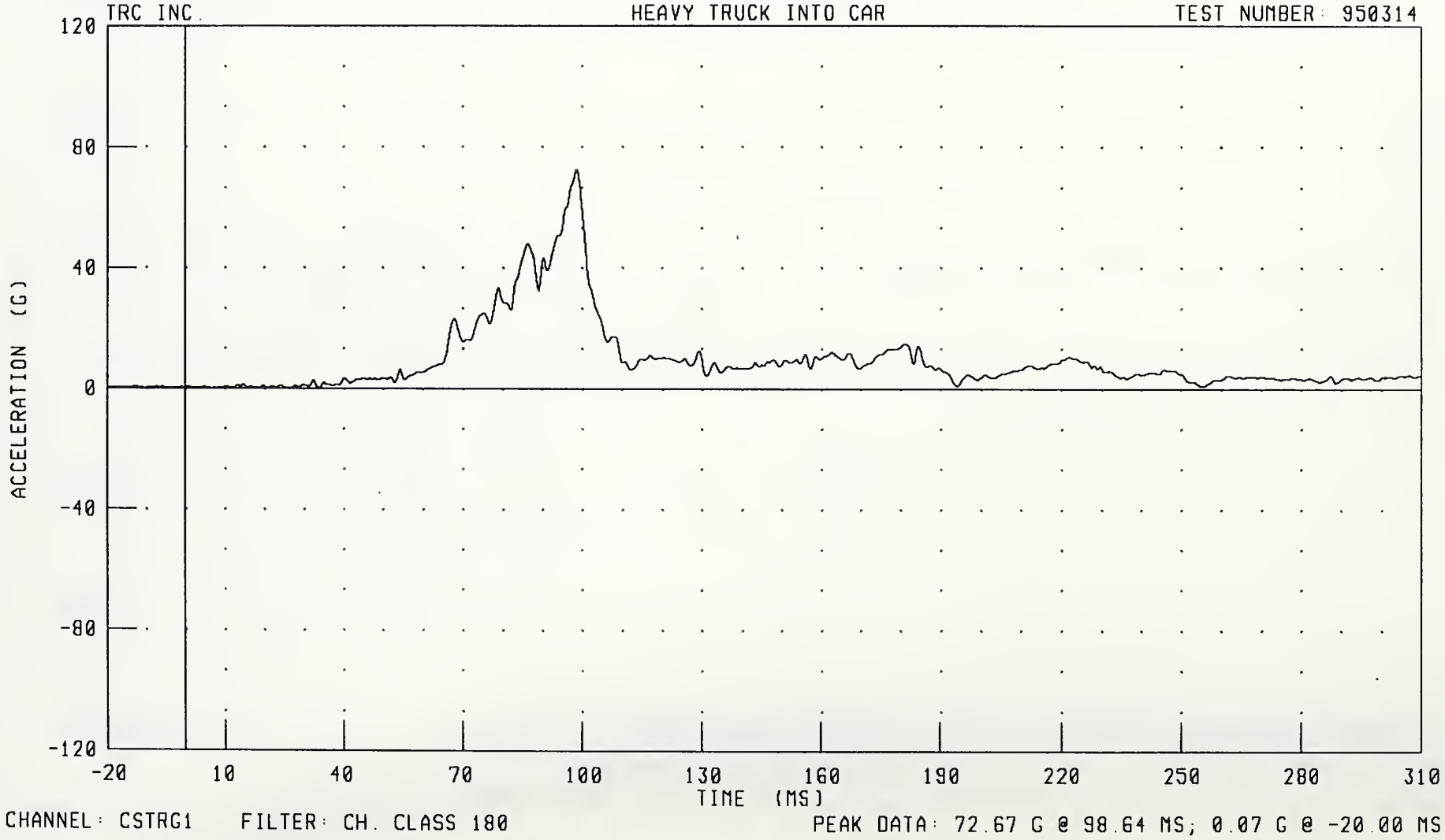
CHANNEL: ENGXG1 FILTER: CH. CLASS 60 PEAK DATA: 25.23 G @ 71.84 MS; -85.48 G @ 54.96 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
ENGINE TOP X-AXIS VELOCITY

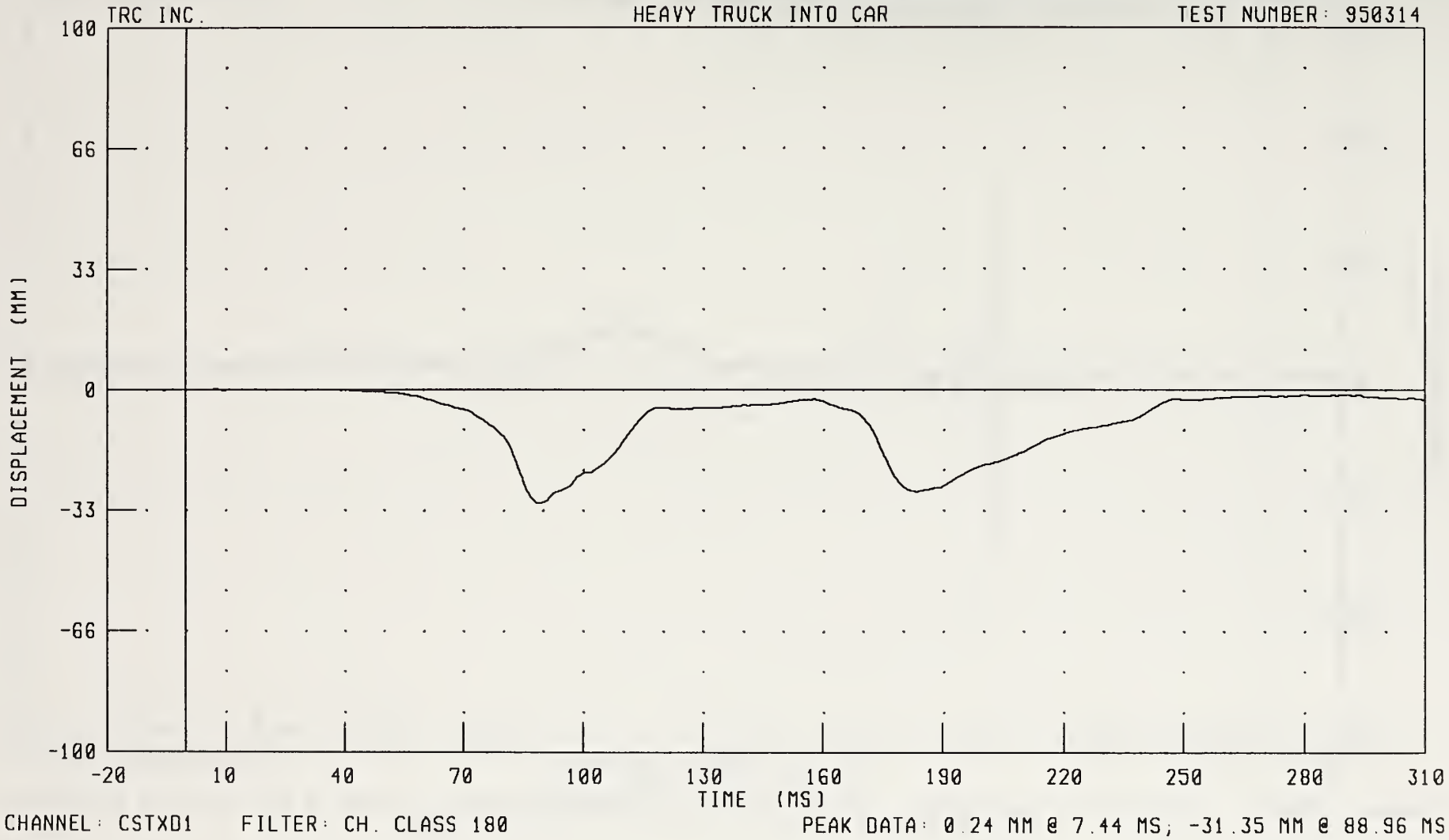


CHANNEL: ENGXV1 FILTER: CH. CLASS 180 PEAK DATA: 0.26 KM/H @ 17.76 MS; -59.78 KM/H @ 310.00 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST RESULTANT ACCELERATION

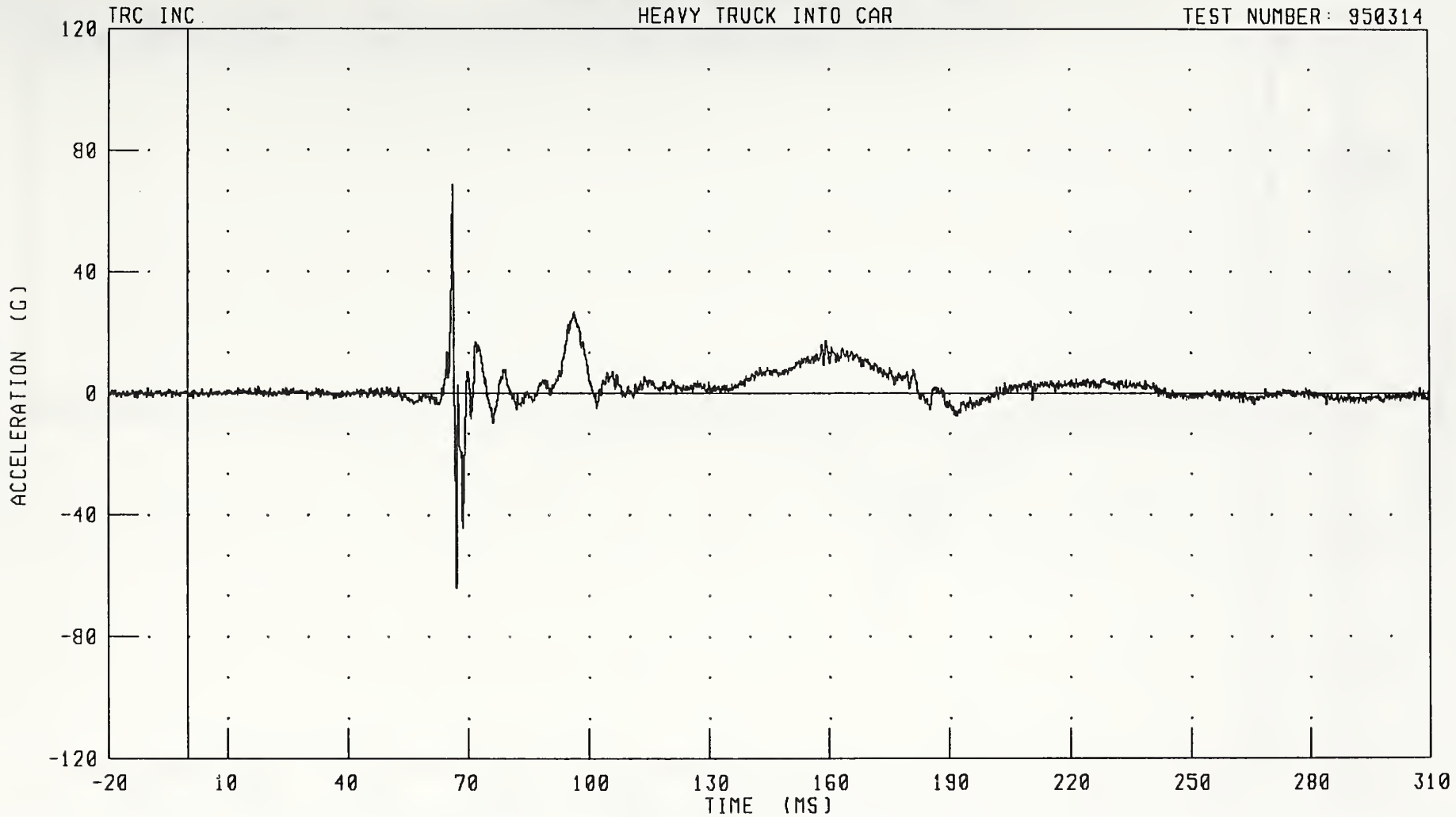


HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER CHEST DEFLECTION



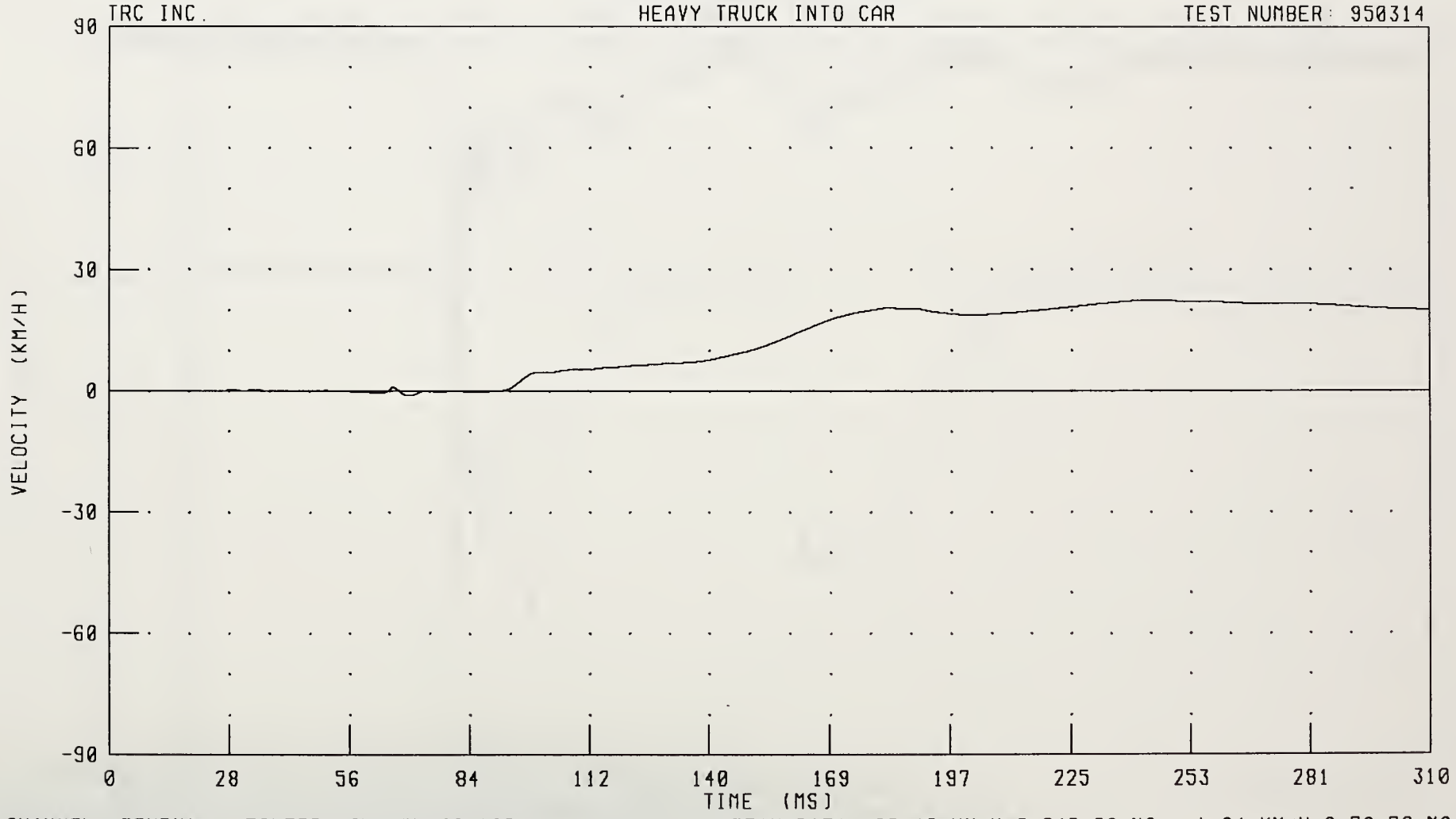
CHANNEL: CSTXD1 FILTER: CH. CLASS 180 PEAK DATA: 0.24 MM @ 7.44 MS; -31.35 MM @ 88.96 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS Z-AXIS ACCELERATION



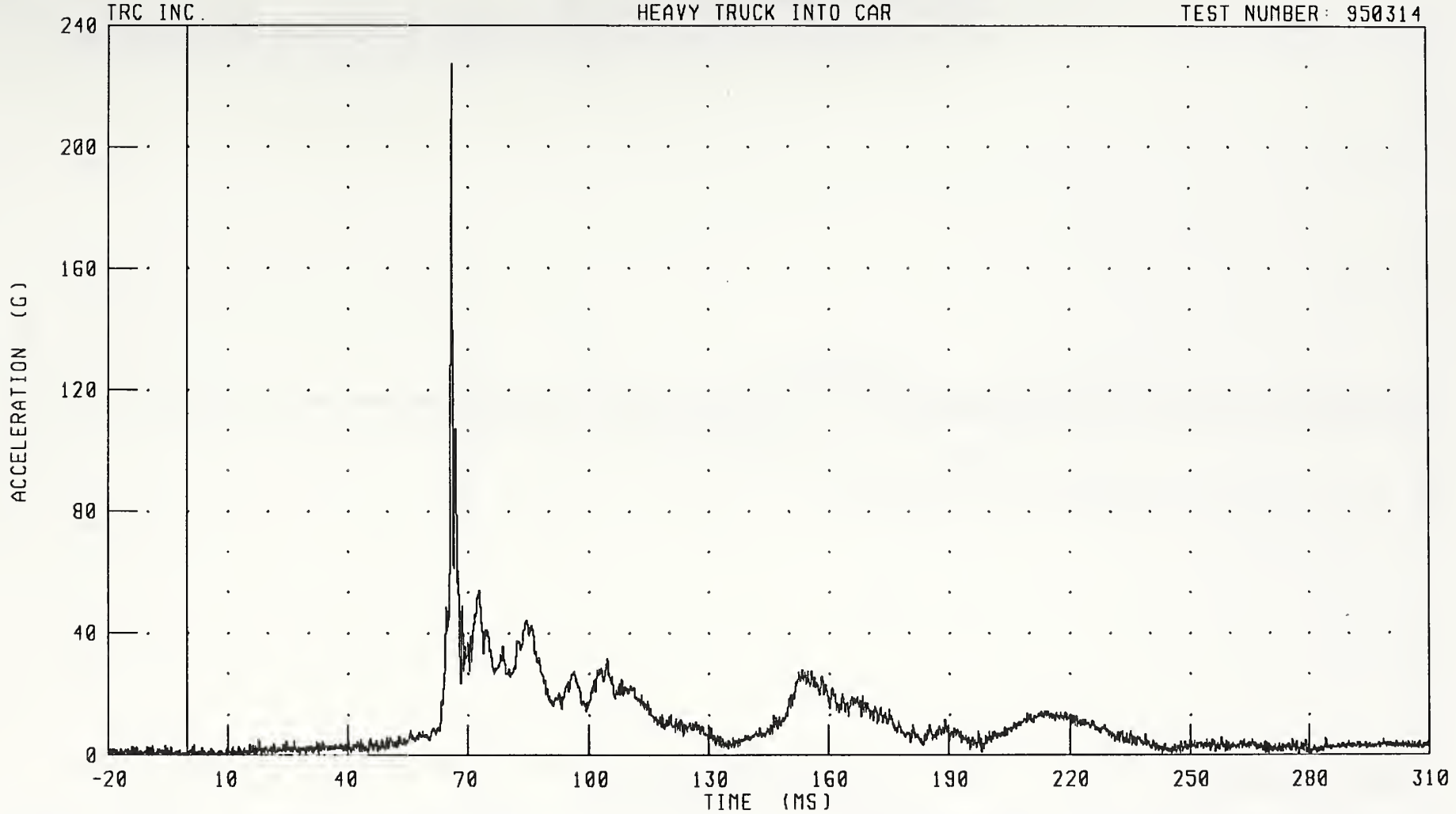
CHANNEL: PEVZG1 FILTER: CH. CLASS 1000 PEAK DATA: 68.85 G @ 66.16 MS; -64.11 G @ 67.04 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS Z-AXIS VELOCITY



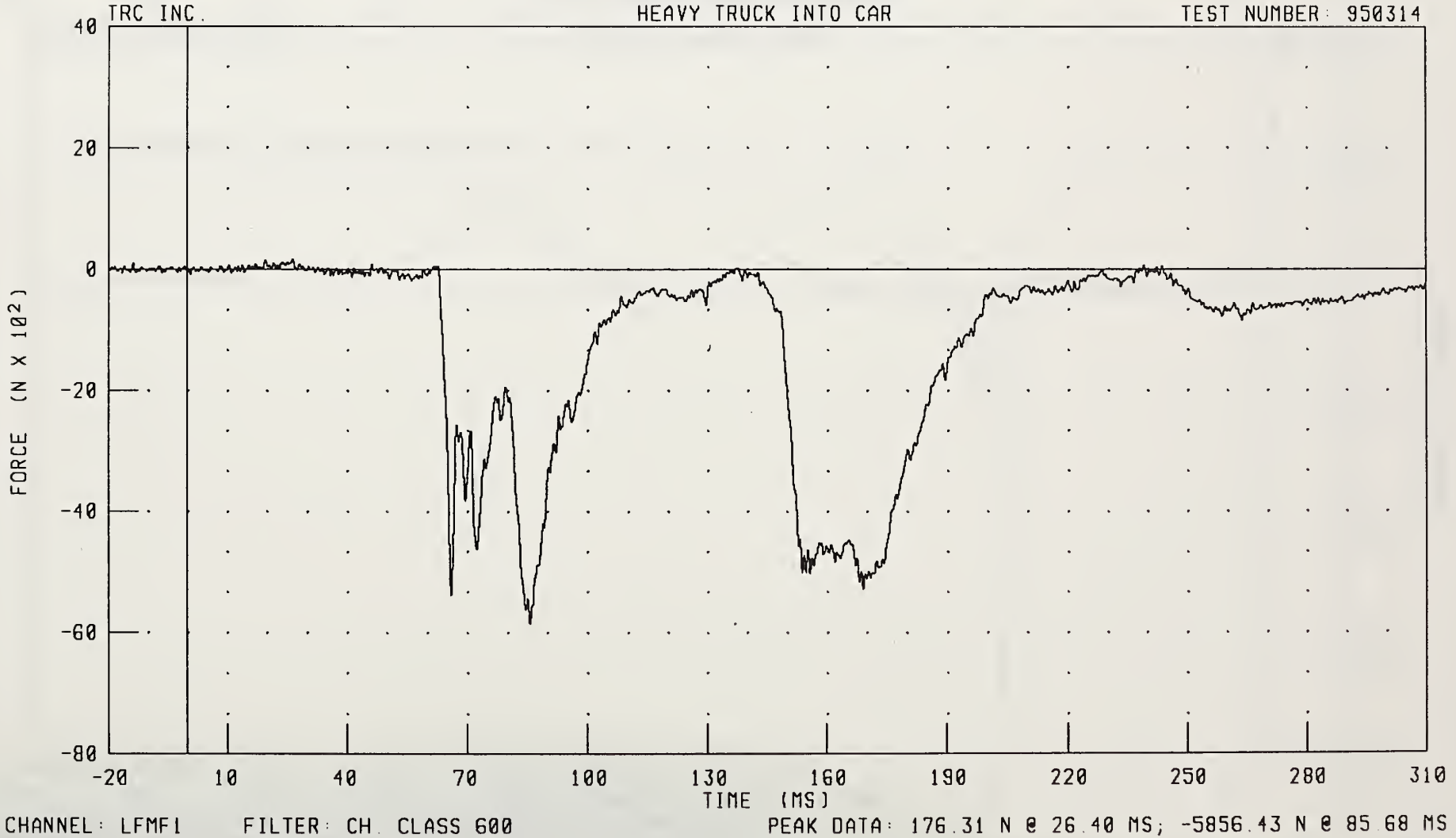
CHANNEL: PEVZV1 FILTER: CH. CLASS 180 PEAK DATA: 22.40 KM/H @ 243.68 MS; -1.04 KM/H @ 70.72 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER PELVIS RESULTANT ACCELERATION



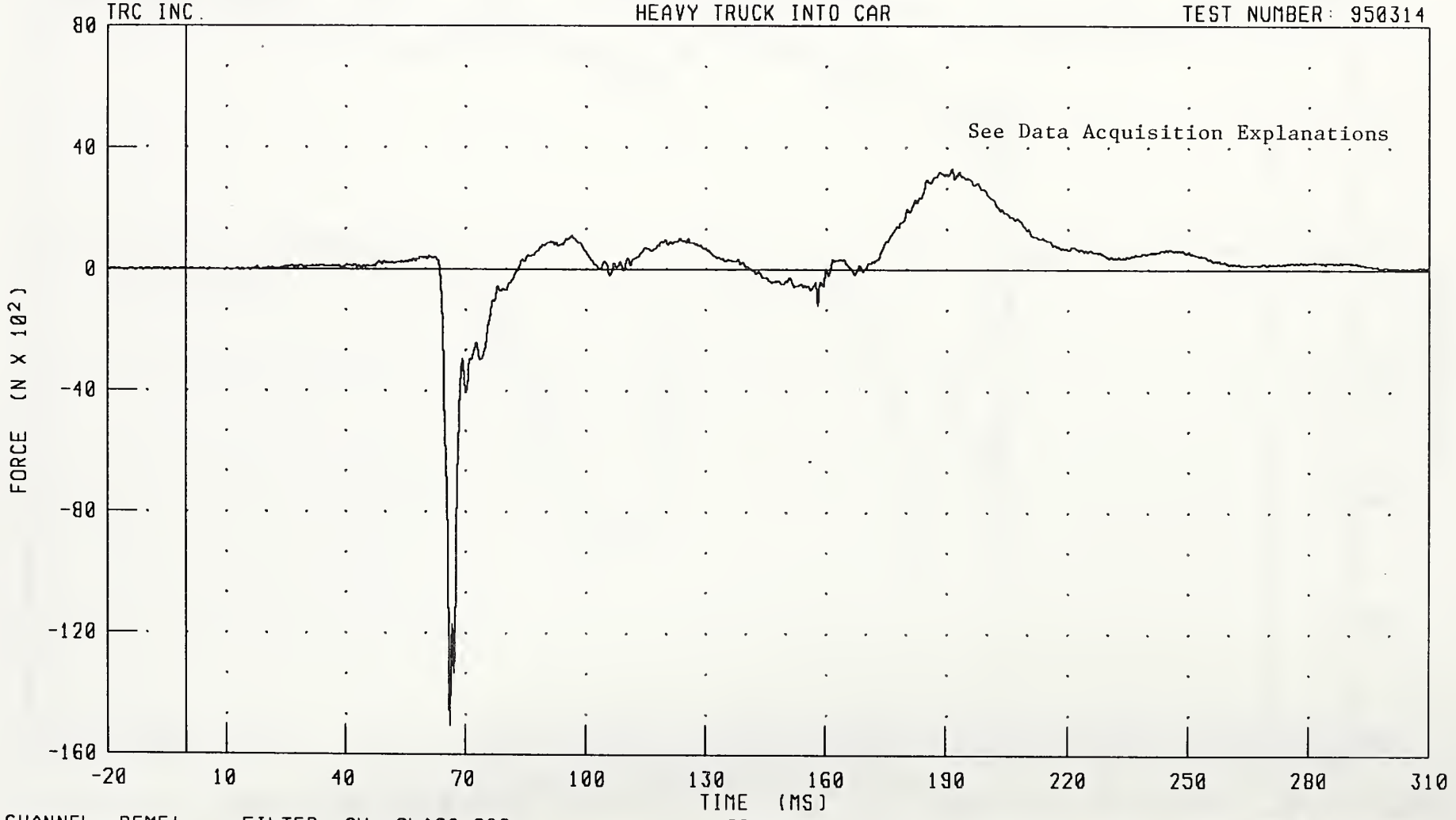
CHANNEL: PEVRG1 FILTER: CH. CLASS 1000 PEAK DATA: 227.25 G @ 66.08 MS; 0.03 G @ 8.24 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER LEFT FEMUR FORCE



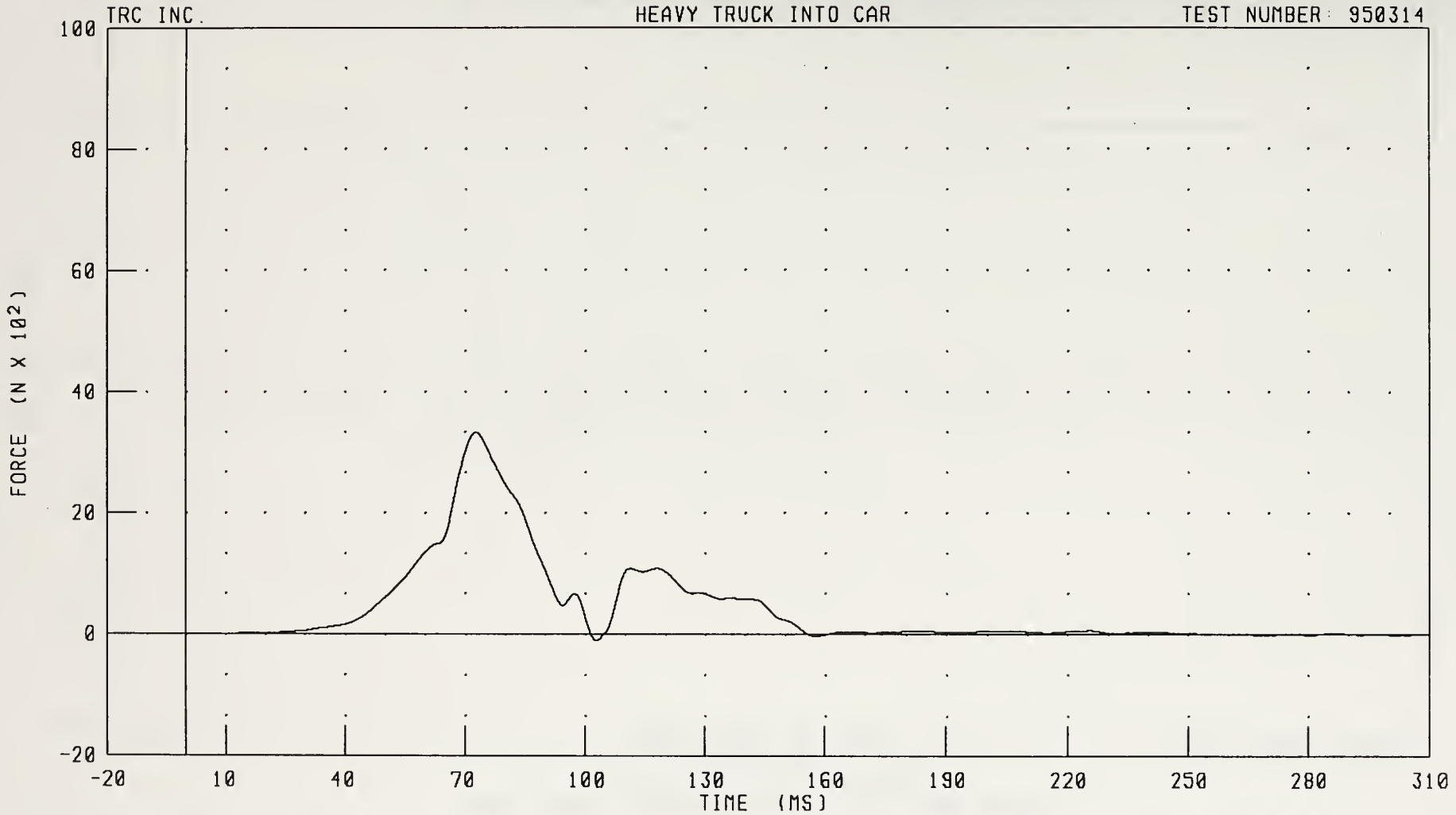
CHANNEL: LFMF1 FILTER: CH. CLASS 600 PEAK DATA: 176.31 N @ 26.40 MS; -5856.43 N @ 85.68 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER RIGHT FEMUR FORCE



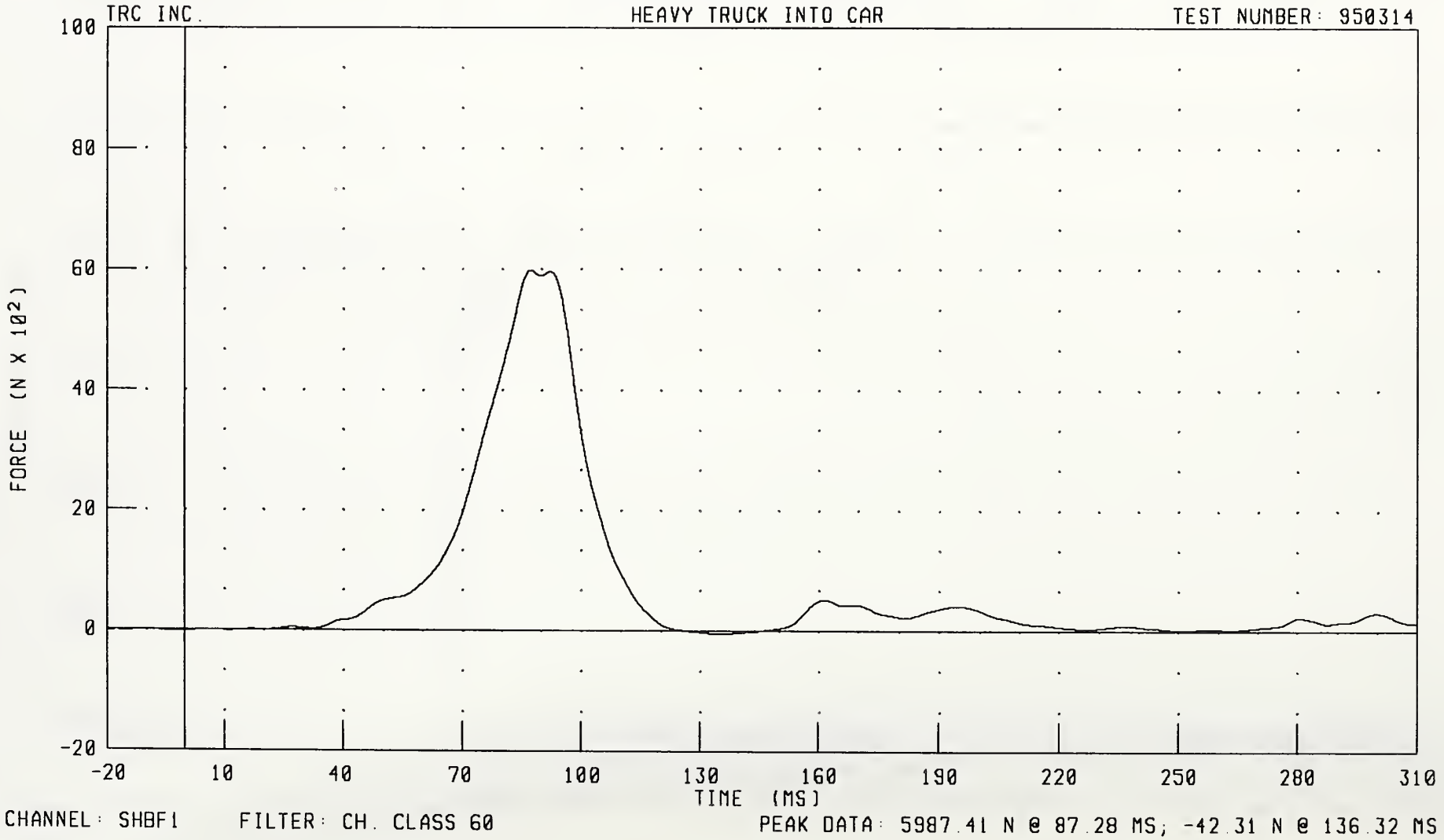
CHANNEL: RFMF1 FILTER: CH. CLASS 600 PEAK DATA: 3329.74 N @ 191.44 MS; -15025.06 N @ 66.16 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER LAP BELT OUTBOARD FORCE



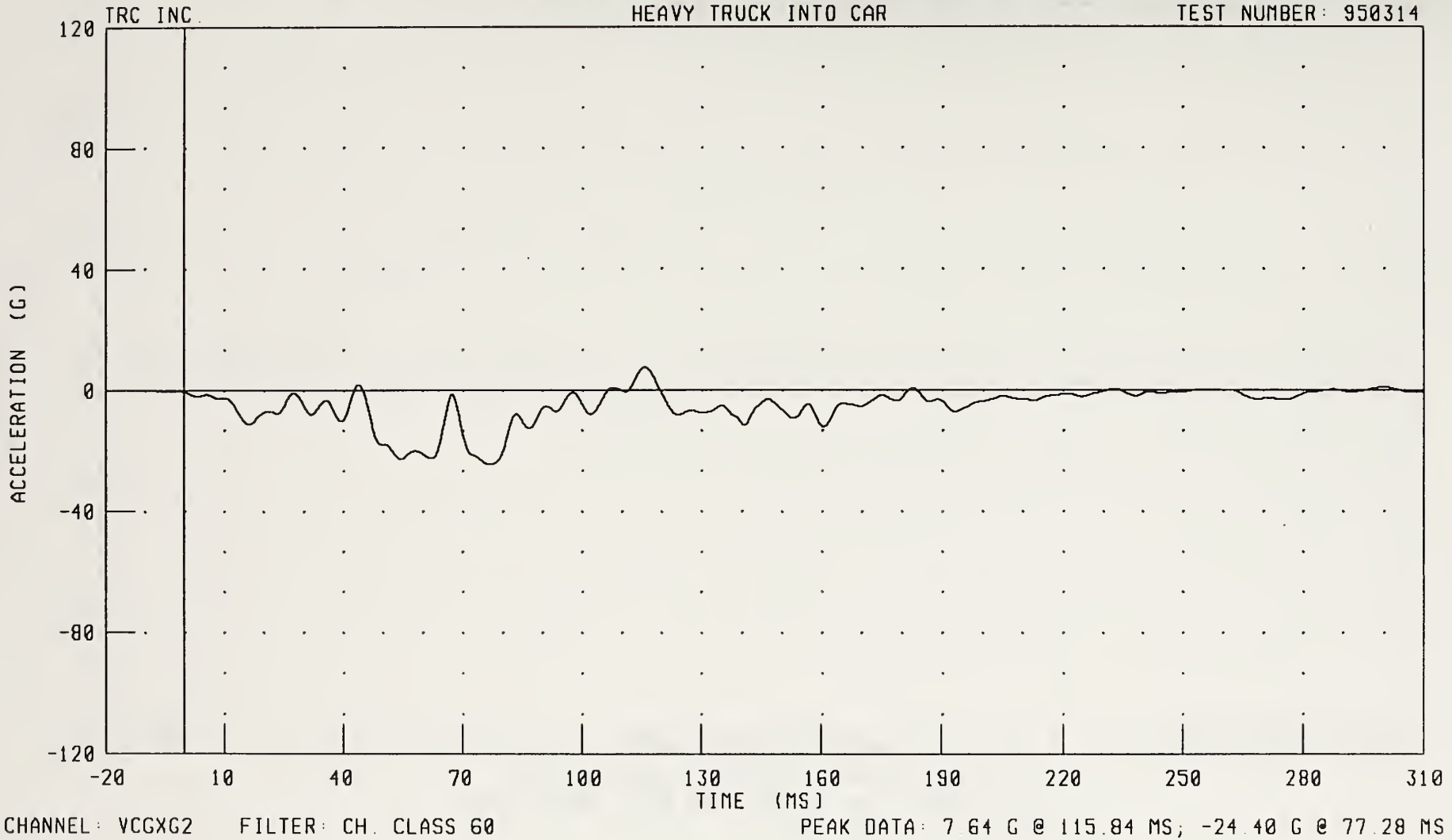
CHANNEL: LBOF1 FILTER: CH. CLASS 60 PEAK DATA: 3326.19 N @ 72.72 MS; -101.54 N @ 102.80 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
DRIVER SHOULDER BELT FORCE



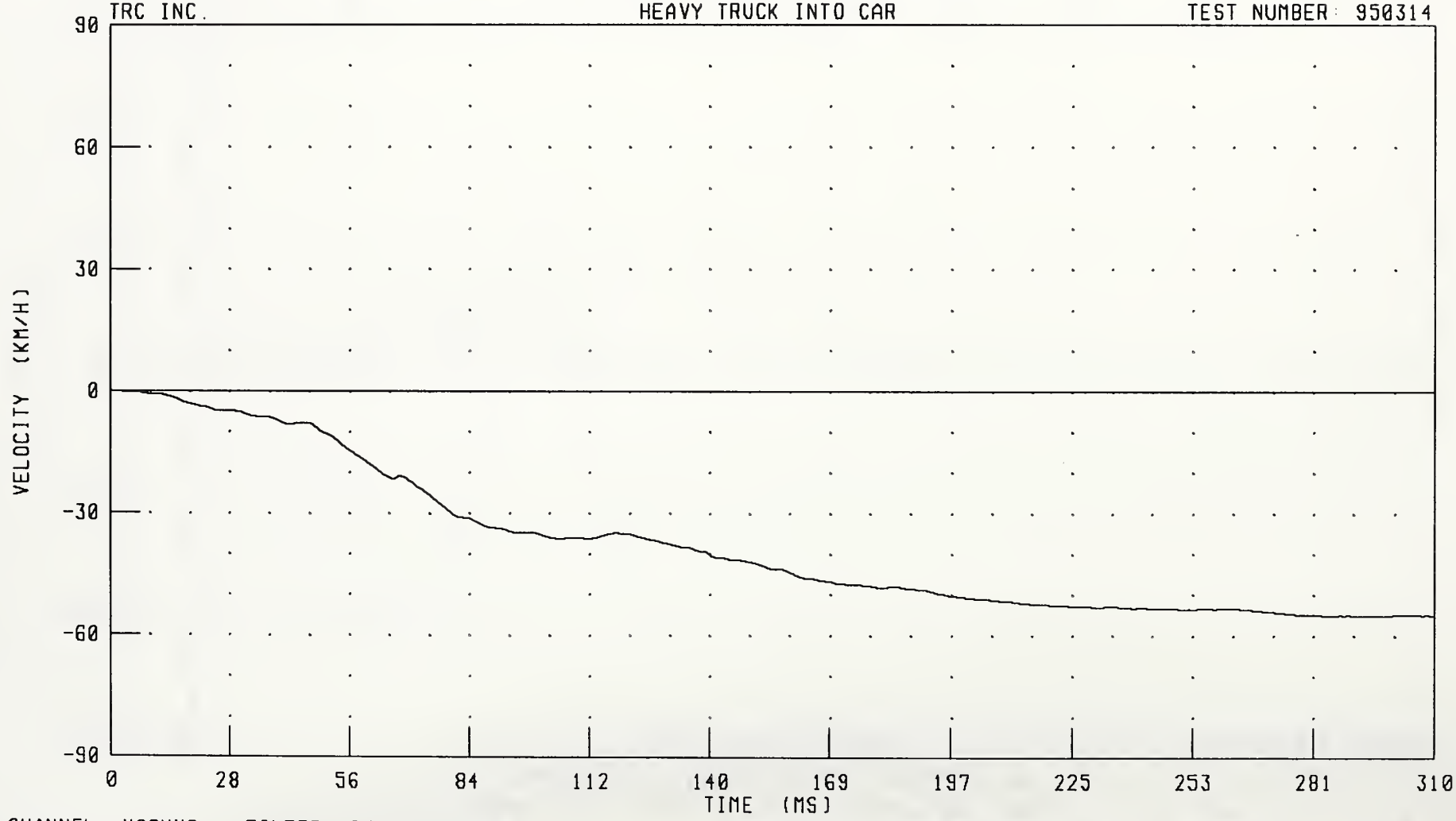
CHANNEL: SHBF1 FILTER: CH. CLASS 60 PEAK DATA: 5987.41 N @ 87.28 MS; -42.31 N @ 136.32 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY X-AXIS ACCELERATION



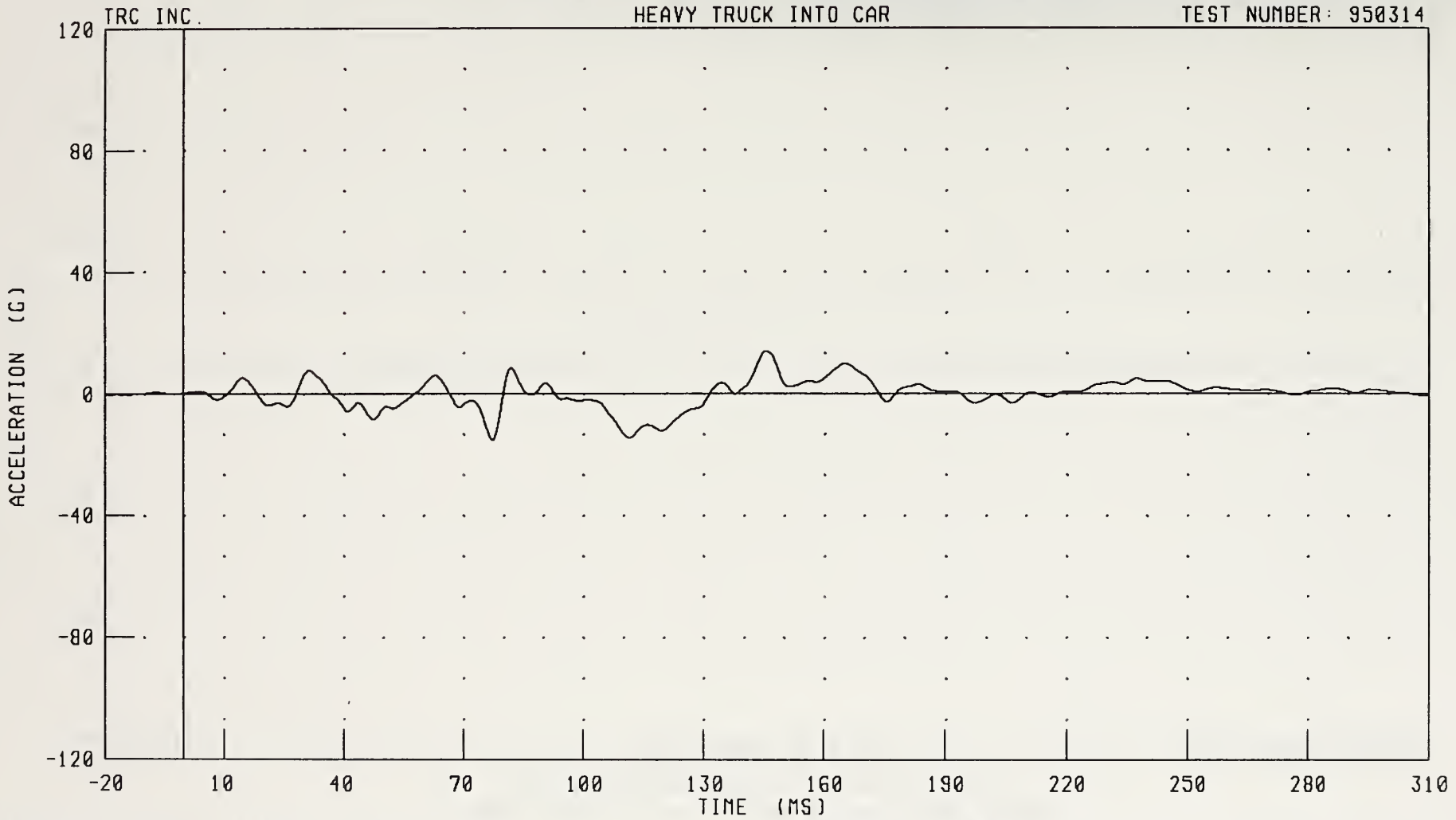
CHANNEL: VCGXG2 FILTER: CH. CLASS 60 PEAK DATA: 7.64 G @ 115.84 MS; -24.40 G @ 77.28 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY X-AXIS VELOCITY



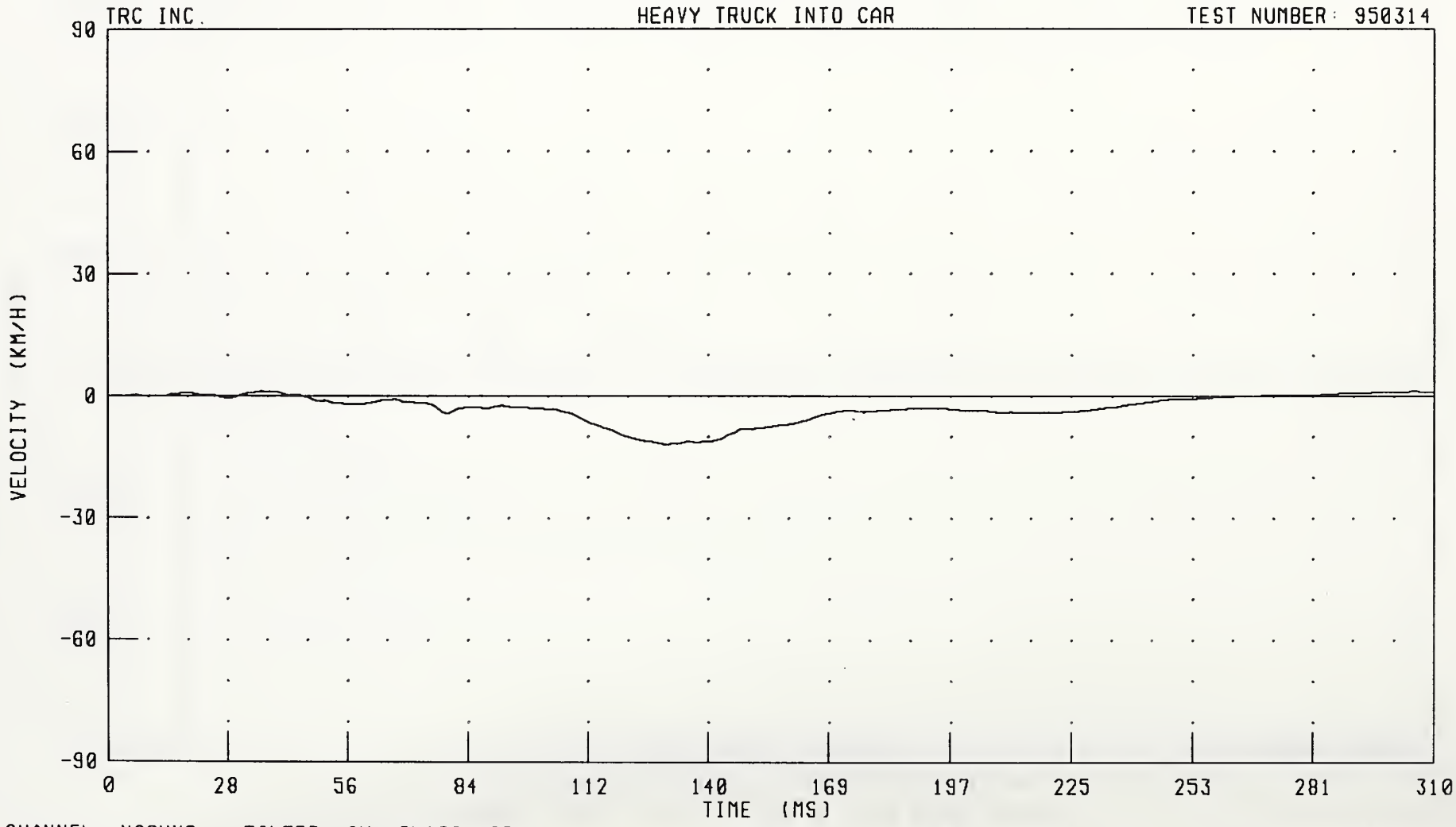
CHANNEL: VCGXV2 FILTER: CH. CLASS 180 PEAK DATA: 0.00 KM/H @ 0.00 MS; -55.08 KM/H @ 296.64 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY Y-AXIS ACCELERATION



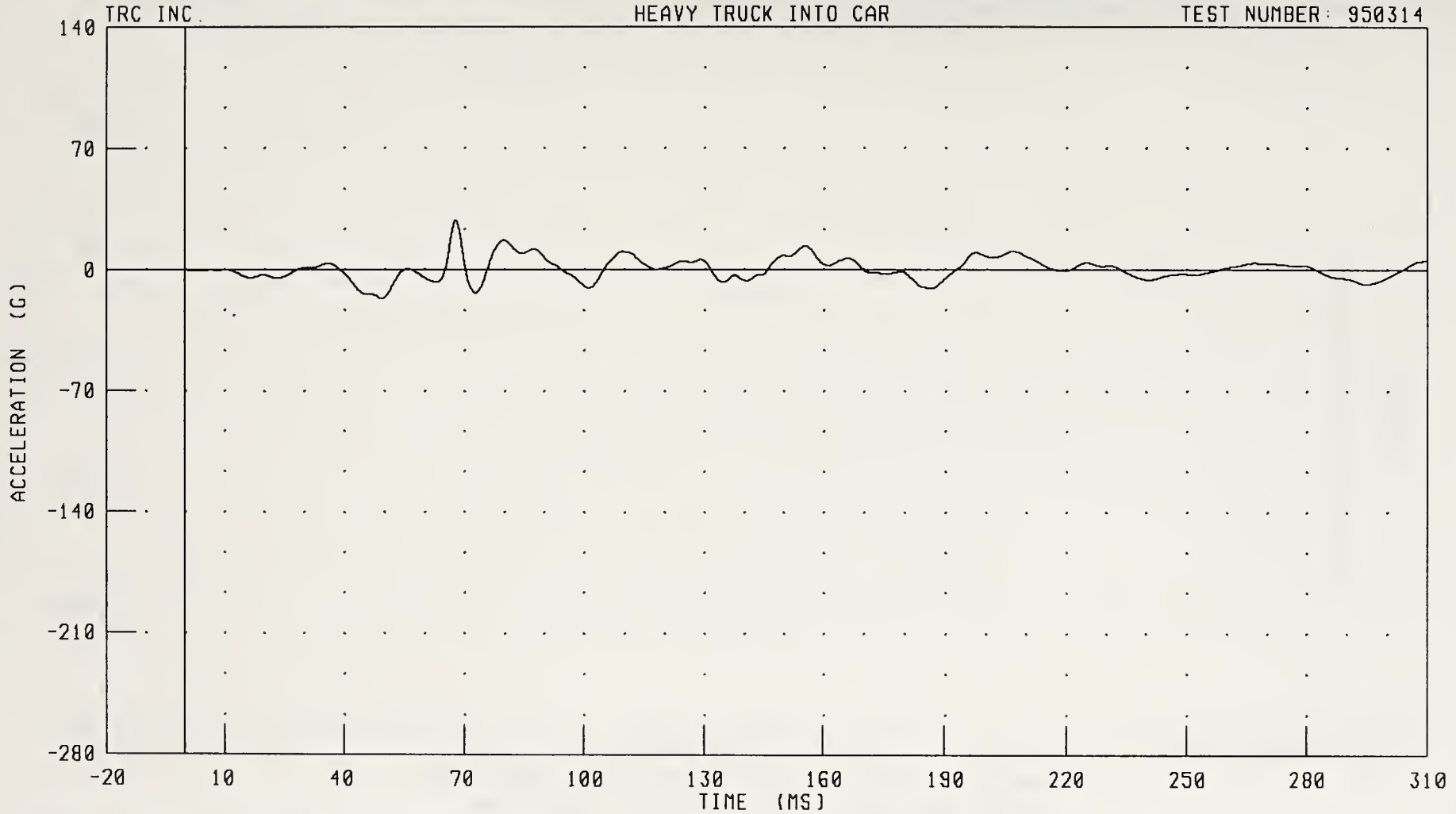
CHANNEL: VCGYG2 FILTER: CH. CLASS 60 PEAK DATA: 13.98 G @ 145.44 MS; -15.15 G @ 77.28 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY Y-AXIS VELOCITY



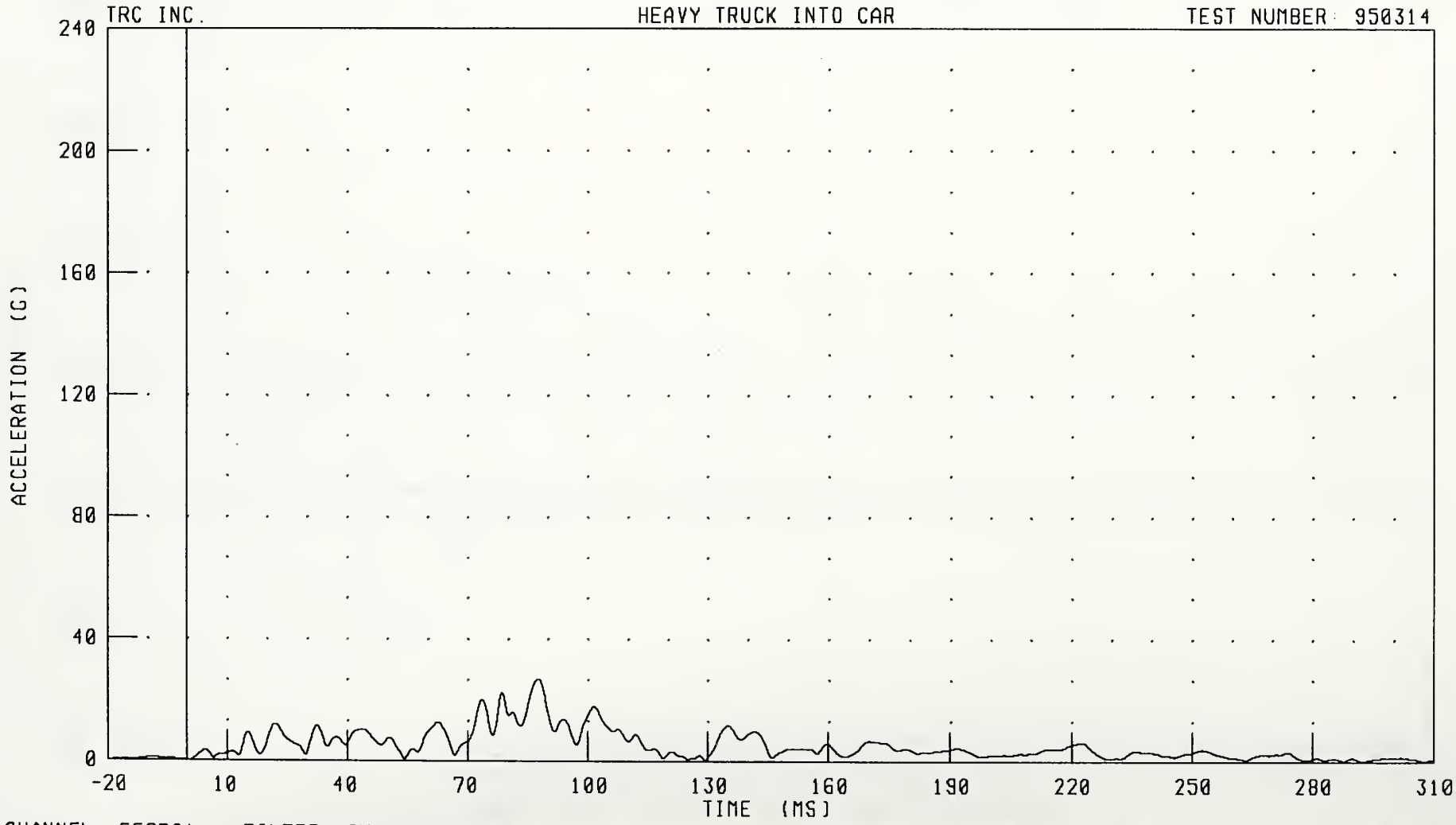
CHANNEL: VCGYV2 FILTER: CH. CLASS 180
PEAK DATA: 1.18 KM/H @ 305.44 MS; -11.84 KM/H @ 131.04 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
CAR CENTER OF GRAVITY Z-AXIS ACCELERATION



CHANNEL: VCGZG2 FILTER: CH. CLASS 60 PEAK DATA: 28.63 G @ 67.76 MS; -16.78 G @ 49.28 MS

HEAVY TRUCK INTO LEFT 50% OF 1987 FORD TAURUS
TRUCK FRONT FRAME CROSSMEMBER RESULTANT ACCELERATION



CHANNEL: FFCRG1 FILTER: CH. CLASS 60 PEAK DATA: 27.03 G @ 87.60 MS; 0.13 G @ -19.44 MS

Appendix C

Dummy Certification Information

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
043 HUMANOID 06-MAR-95

TRC INC. TEST NO: 43C10ED1 572E SN043 EXT.DIMENSION CAL10

TEST PARAMETER (DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226 - 231 MM	229. MM
CHEST CIRCUMFERENCE (Y)	970 -1001 MM	998. MM
WAIST CIRCUMFERENCE (Z)	836 - 866 MM	856. MM
CHEST DEPTH (O)	213 - 229 MM	221. MM
H-POINT HEIGHT (C)	84 - 89 MM	89. MM
H-POINT FROM SEATBACK (D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE (H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT (A)	879 - 889 MM	881. MM
THIGH CLEARANCE (F)	140 - 155 MM	155. MM
BUTTOCK KNEE LENGTH (K)	579 - 605 MM	599. MM
BUTTOCK POPLITEAL LENGTH (N)	452 - 478 MM	472. MM
POPLITEAL HEIGHT (L)	429 - 455 MM	429. MM
KNEE PIVOT HEIGHT (M)	485 - 500 MM	493. MM
FOOT LENGTH (P)	252 - 267 MM	262. MM
FOOT BREADTH (W)	91 - 107 MM	102. MM
SHOULDER PIVOT FROM BACKLINE (E)	84 - 94 MM	94. MM
SHOULDER BREADTH (V)	422 - 437 MM	427. MM
SHOULDER PIVOT HEIGHT (B)	506 - 521 MM	513. MM
ELBOW REST HEIGHT (J)	191 - 211 MM	203. MM
SHOULDER-ELBOW LENGTH (I)	330 - 345 MM	338. MM
BACK OF ELBOW TO WRIST PIVOT (G)	290 - 305 MM	292. MM

DUMMY MEETS SPECIFICATIONS—
TECHNICIAN Pete Foss RUN NUMBER: 030895.0736

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

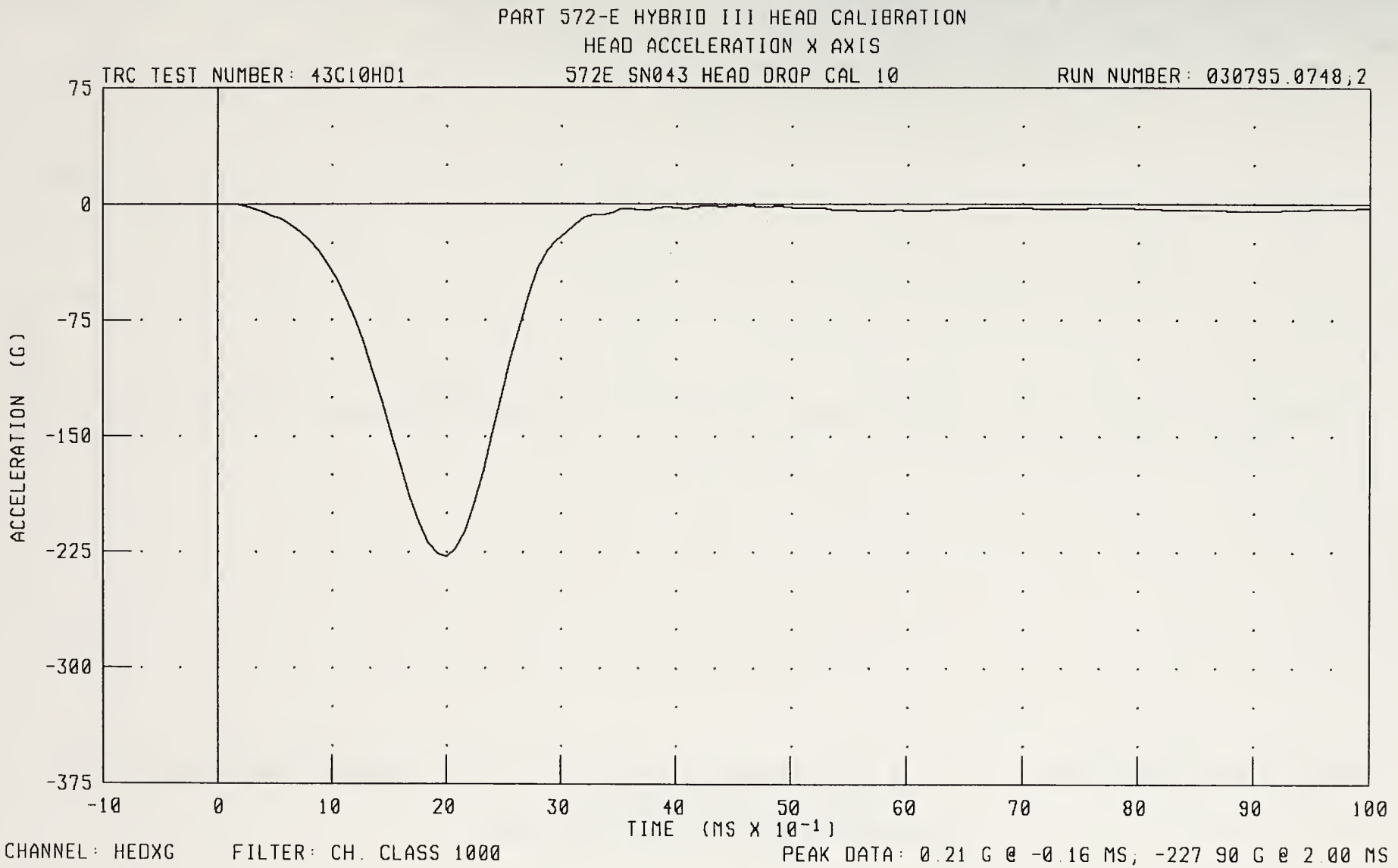
HYBRID III 07-MAR-95

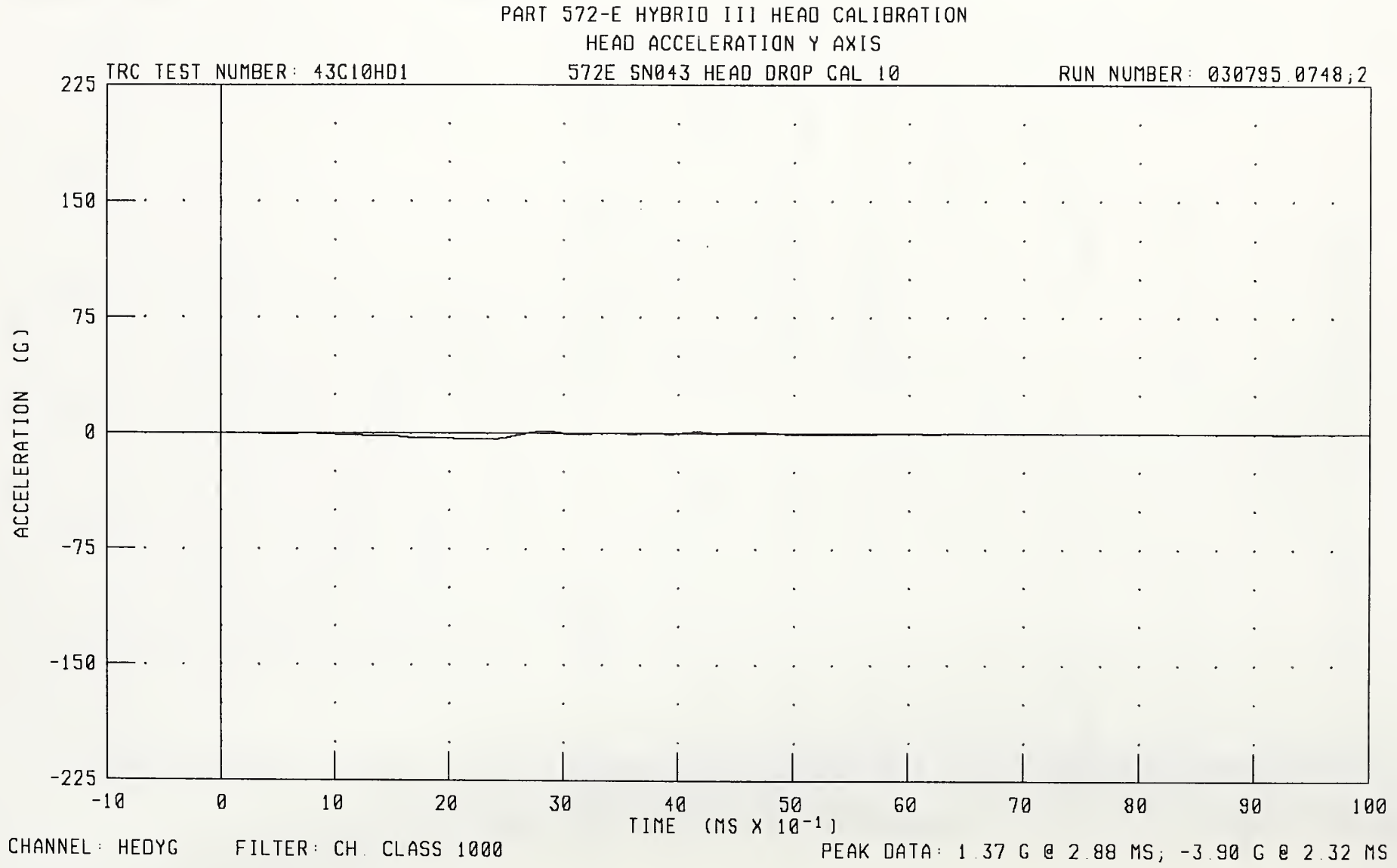
TRC INC. TEST NO: 43C10HD1 572E SN043 HEAD DROP CAL 10

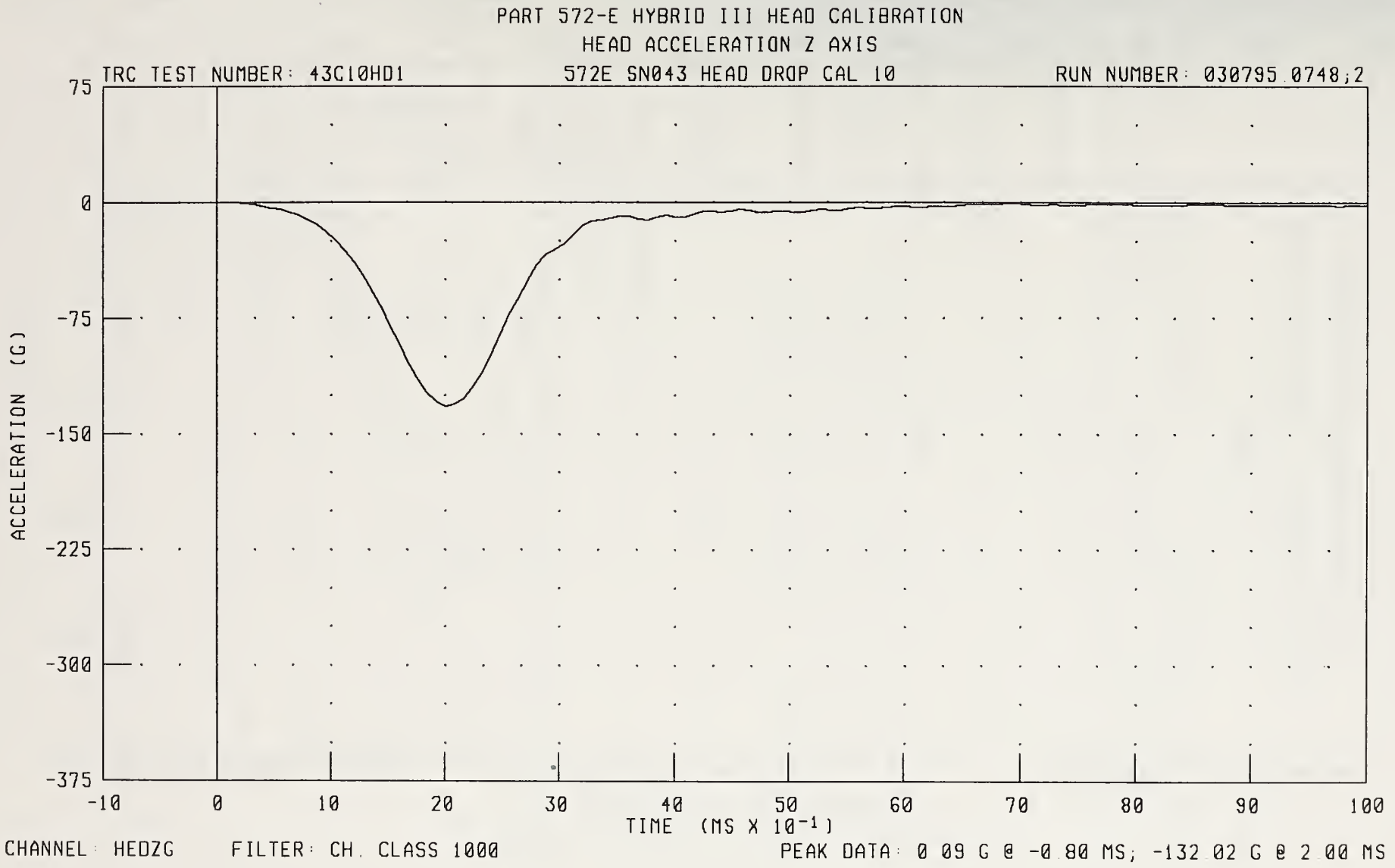
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	52.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	263.40 G
PEAK LATERAL ACCELERATION	15 G MAX	-3.90 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

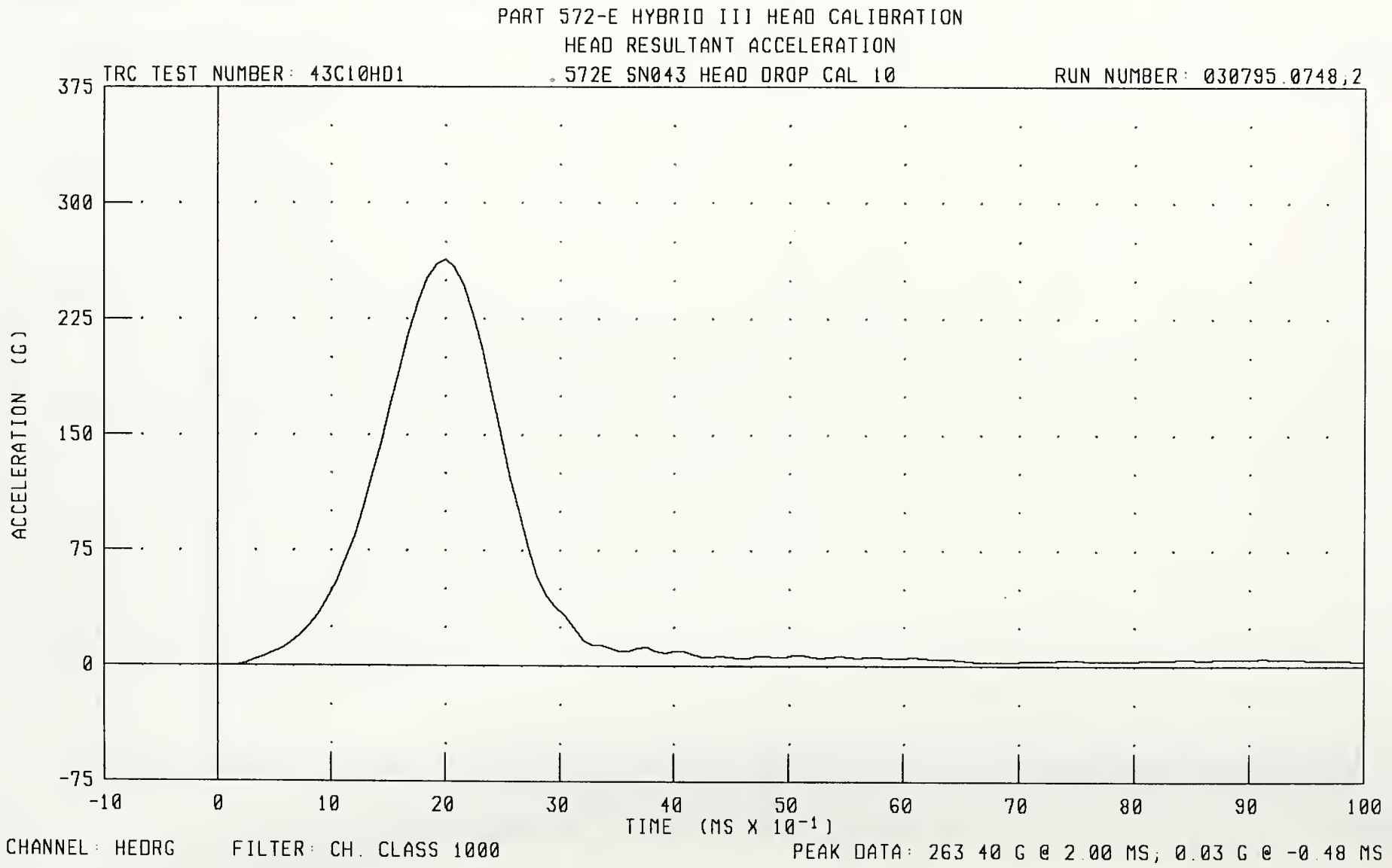
TEST MEETS SPECIFICATIONS

TECHNICIAN  RUN NUMBER: 030795.0748;2


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS
TRC TEST NUMBER: 43C10HD1
572E SN043 HEAD DROP CAL 10
RUN NUMBER: 030795.0748;2
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDXG
FILTER: CH. CLASS 1000
PEAK DATA: 0.21 G @ -0.16 MS; -227.90 G @ 2.00 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS
TRC TEST NUMBER: 43C10HD1
572E SN043 HEAD DROP CAL 10
RUN NUMBER: 030795.0748;2
225
150
75
0
-75
-150
-225
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDYG
FILTER: CH. CLASS 1000
PEAK DATA: 1.37 G @ 2.88 MS; -3.90 G @ 2.32 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS
TRC TEST NUMBER: 43C10HD1
572E SN043 HEAD DROP CAL 10
RUN NUMBER: 030795 0748;2
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10⁻¹)
CHANNEL: HEDZG
FILTER: CH. CLASS 1000
PEAK DATA: 0.09 G @ -0.80 MS; -132.02 G @ 2.00 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION
TRC TEST NUMBER: 43C10HD1
572E SN043 HEAD DROP CAL 10
RUN NUMBER: 030795.0748,2
375
300
225
150
75
0
-75
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDRG
FILTER: CH. CLASS 1000
PEAK DATA: 263.40 G @ 2.00 MS; 0.03 G @ -0.48 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III 07-MAR-95

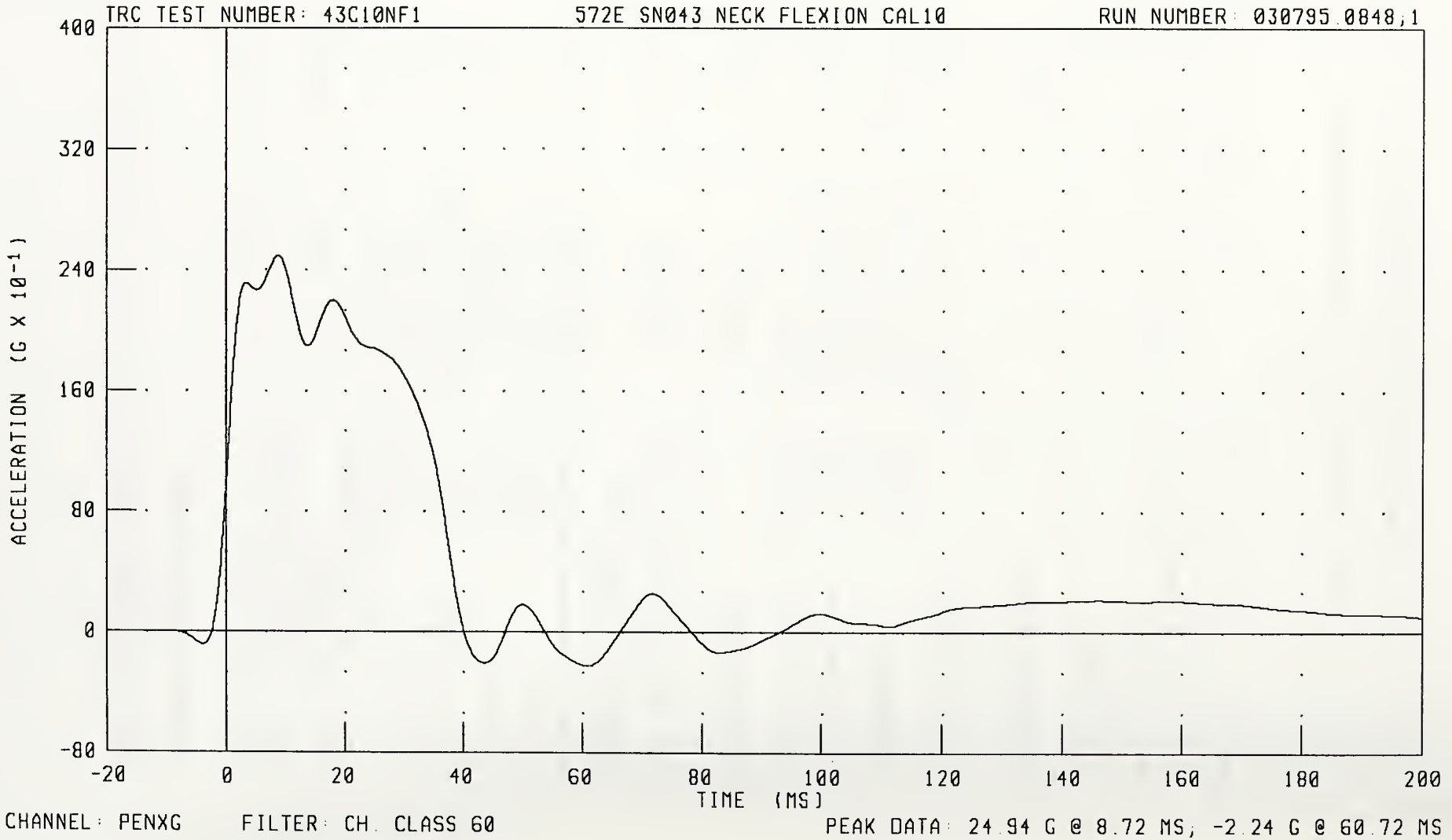
TRC INC. TEST NO: 43C10NF1 572E SN043 NECK FLEXION CAL10

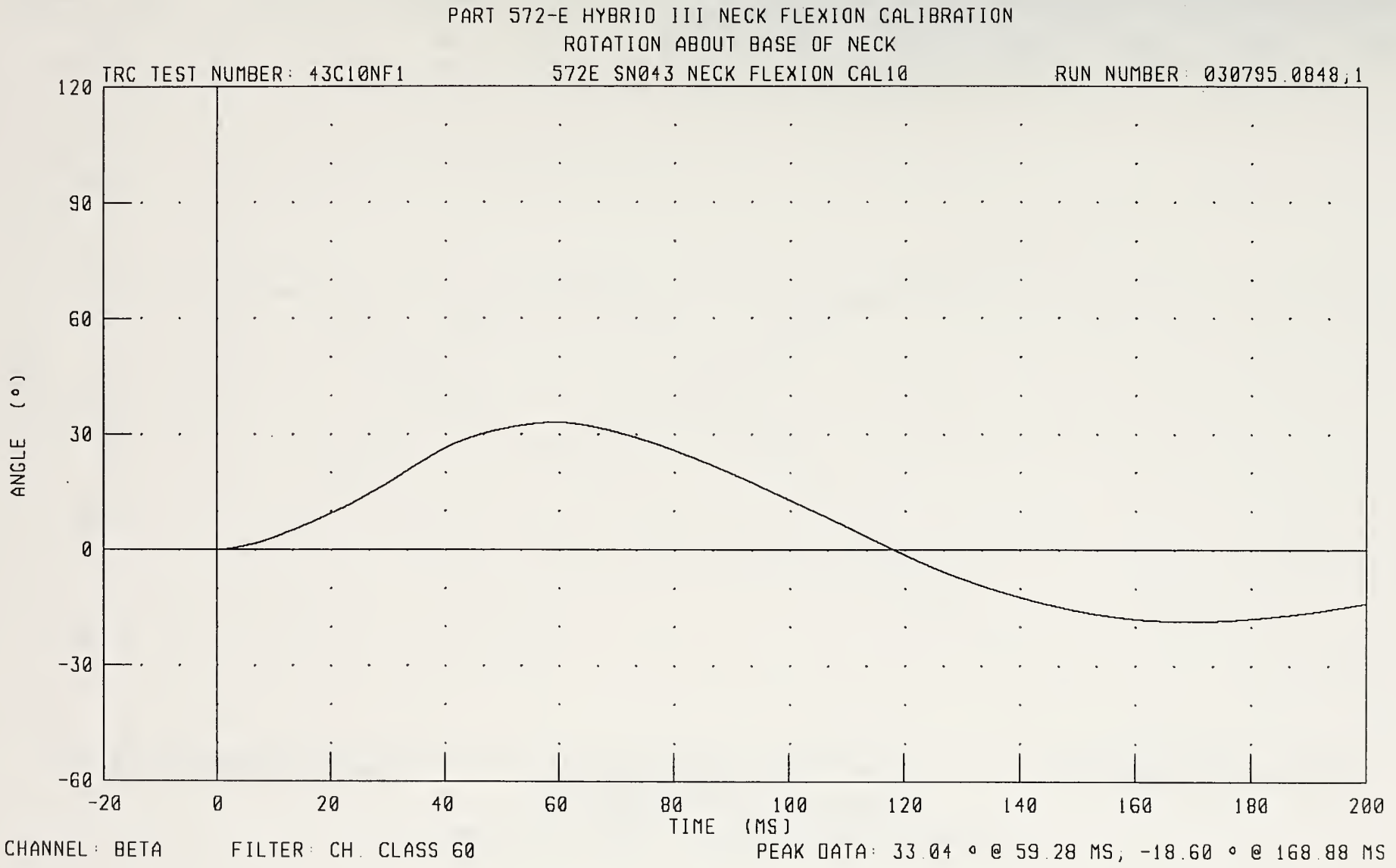
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	52.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	7.06 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	24.04 G
	20 MS	17.60 - 22.60 G	20.93 G
	30 MS	12.50 - 18.50 G	17.00 G
MAX PENDULUM G		29 G MAX	24.94 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.94 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	37.76 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	69.51 DEG.
	TIME	57 - 64 MS	59.28 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	97.34 NM
	TIME	47 - 58 MS	51.12 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	116.80 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	97.52 MS

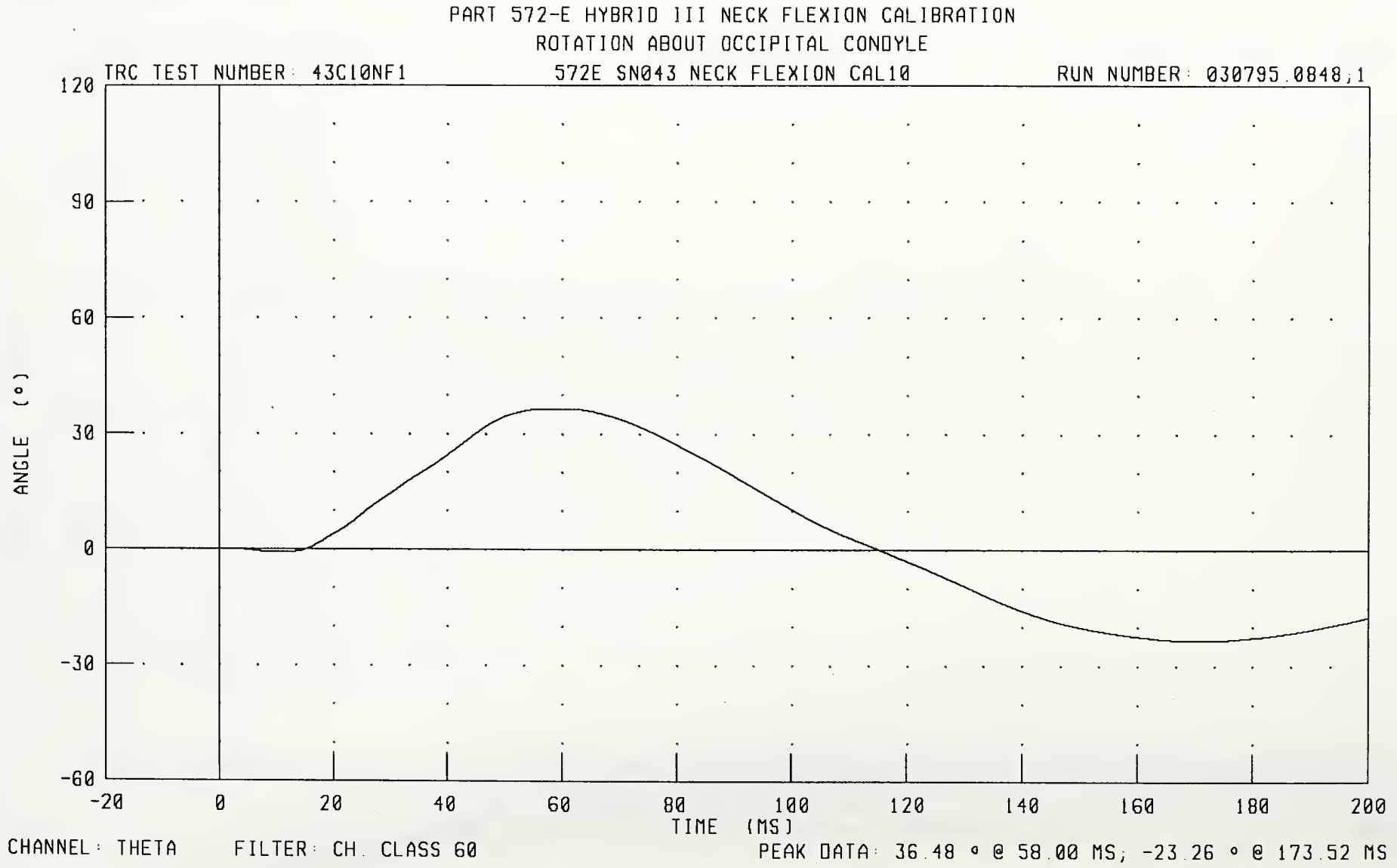
TEST MEETS SPECIFICATIONS

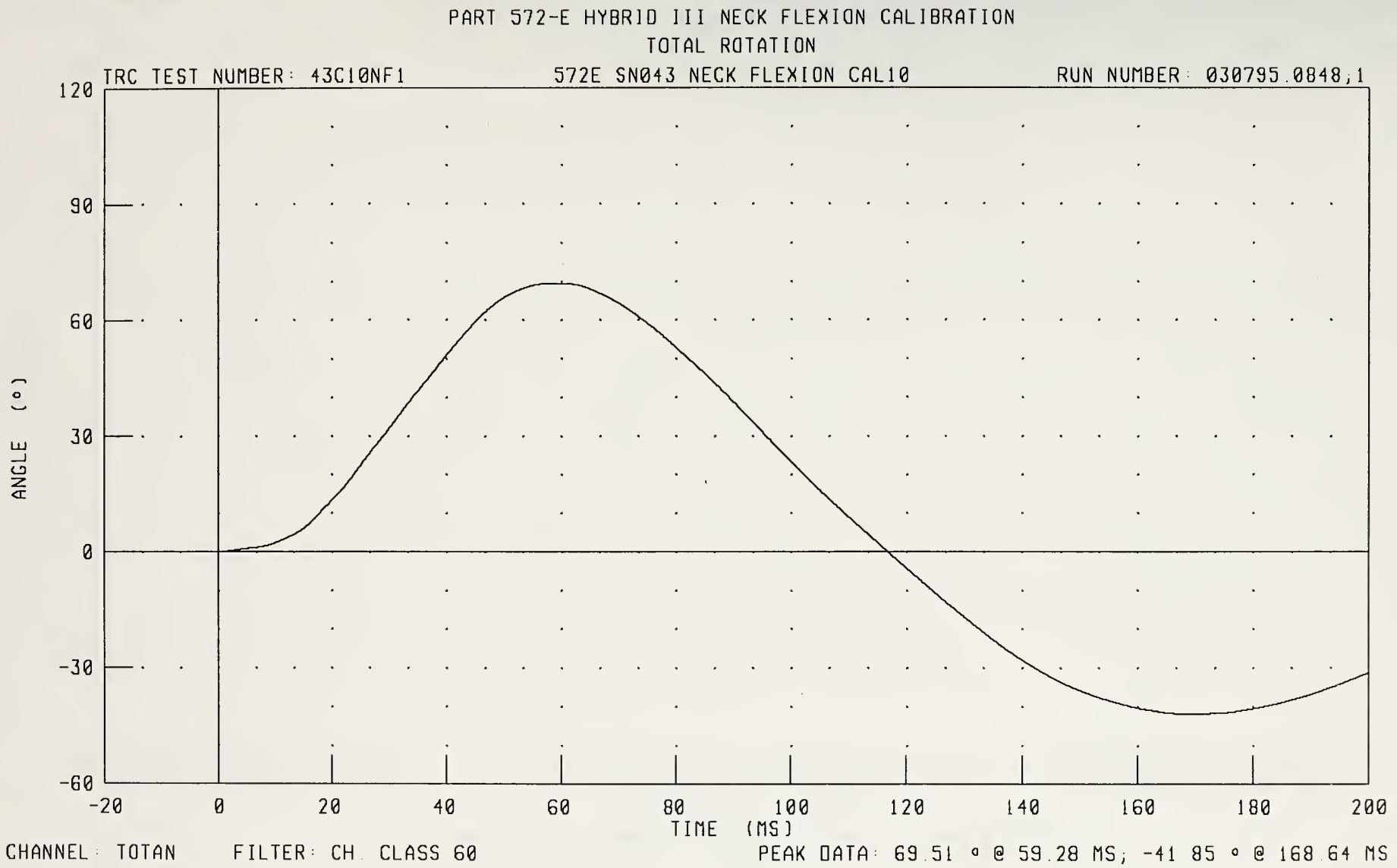
TECHNICIAN Peter Eck RUN NUMBER: 030795.0838;1

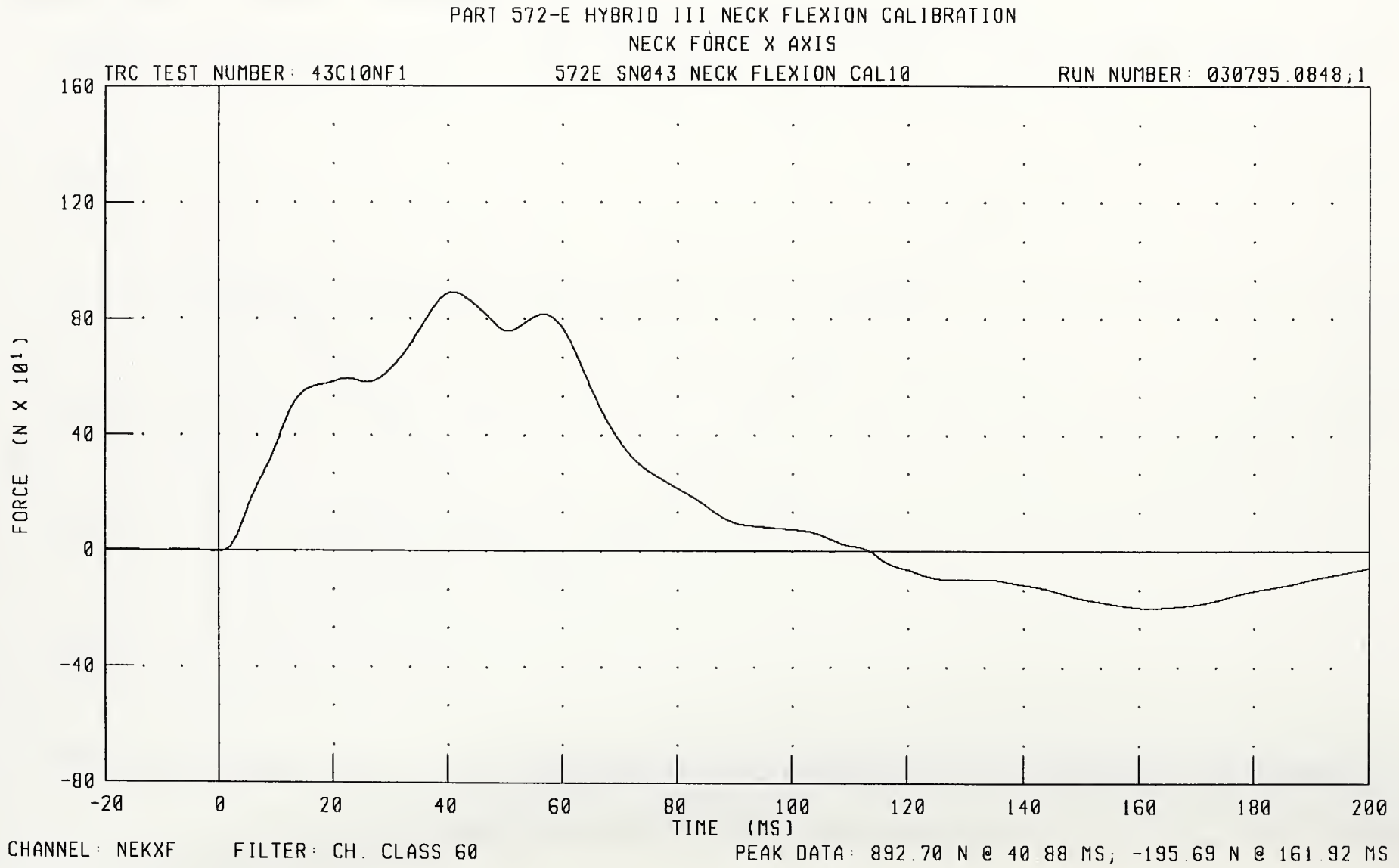
PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION

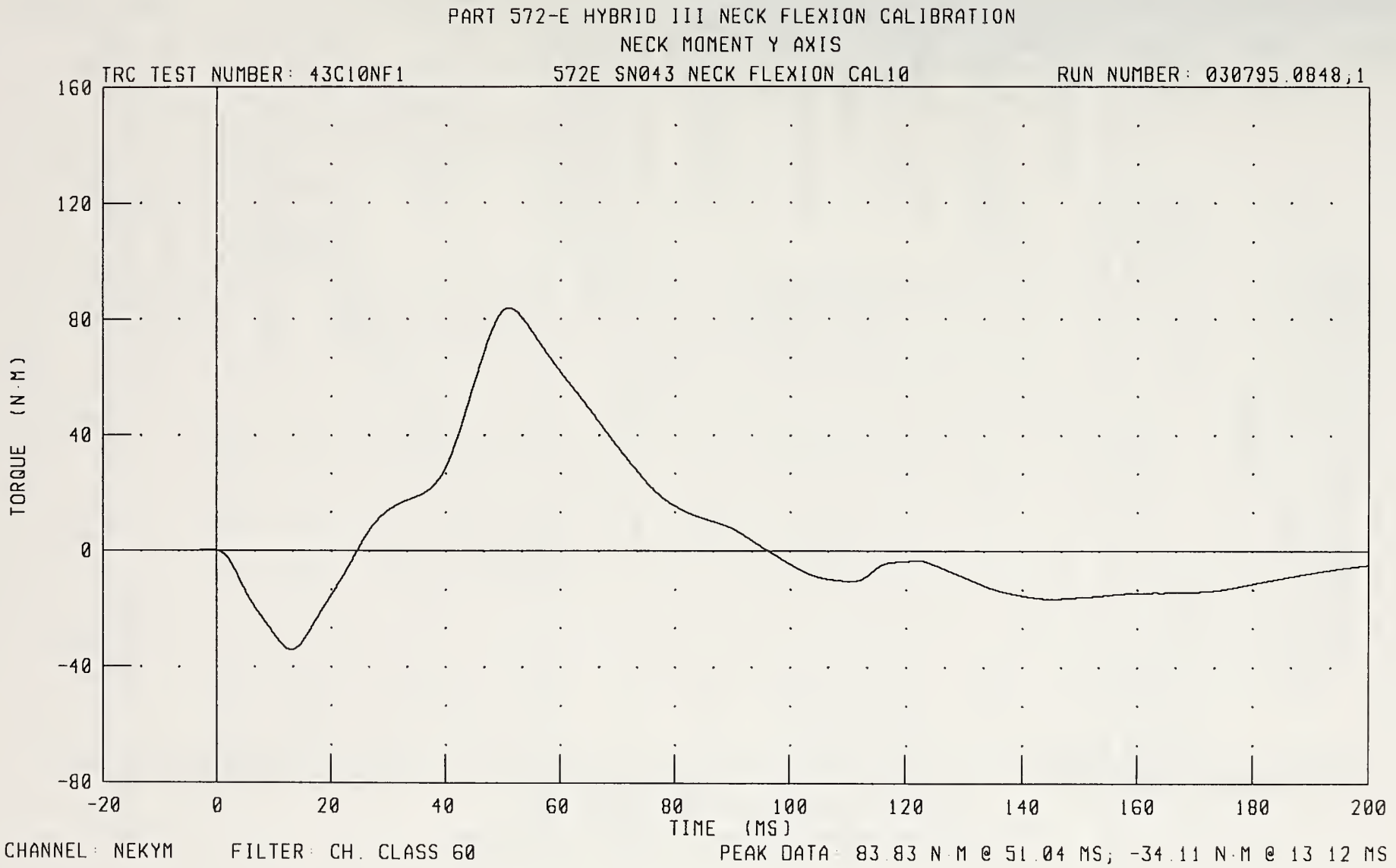



PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK
TRC TEST NUMBER: 43C10NF1
572E SN043 NECK FLEXION CAL10
RUN NUMBER: 030795.0848;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 33.04 ° @ 59.28 MS, -18.60 ° @ 168.88 MS

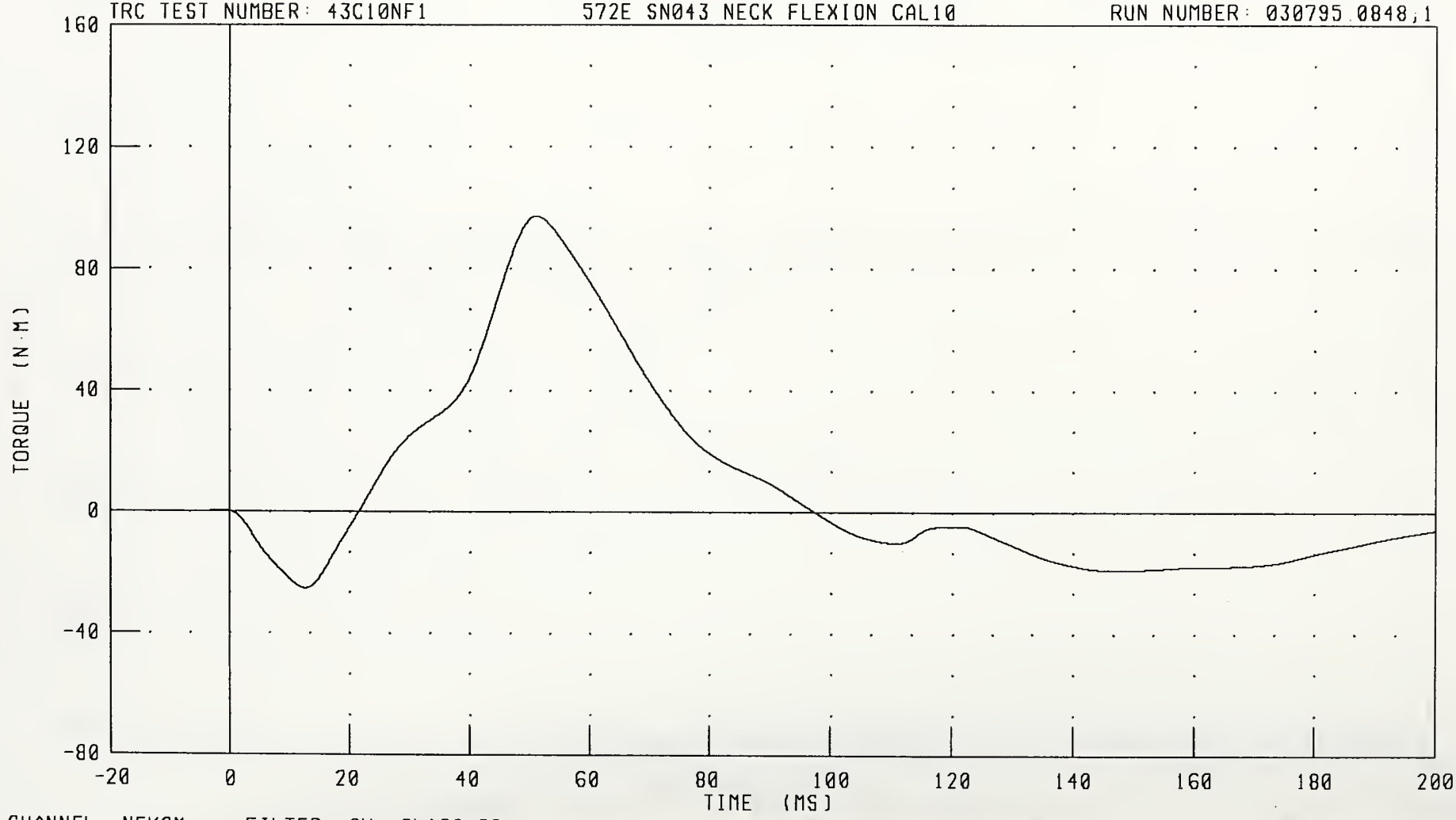

PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE
TRC TEST NUMBER: 43C10NF1
572E SN043 NECK FLEXION CAL10
RUN NUMBER: 030795.0848;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: THETA
FILTER: CH. CLASS 60
PEAK DATA: 36.48 ° @ 58.00 MS; -23.26 ° @ 173.52 MS


PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION
TRC TEST NUMBER: 43C10NF1
572E SN043 NECK FLEXION CAL10
RUN NUMBER: 030795.0848;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: TOTAN
FILTER: CH. CLASS 60
PEAK DATA: 69.51 ° @ 59.28 MS; -41.85 ° @ 168.64 MS


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS
TRC TEST NUMBER: 43C10NF1
572E SN043 NECK FLEXION CAL10
RUN NUMBER: 030795.0848;1
160
120
80
40
0
-40
-80
FORCE (N X 10¹)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKXF
FILTER: CH. CLASS 60
PEAK DATA: 892.70 N @ 40.88 MS; -195.69 N @ 161.92 MS


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 43C10NF1
572E SN043 NECK FLEXION CAL10
RUN NUMBER: 030795.0848;1
160
120
80
40
0
-40
-80
TORQUE (N-M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 83.83 N-M @ 51.04 MS; -34.11 N-M @ 13.12 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 97.34 N-M @ 51.12 MS; -25.22 N-M @ 12.64 MS

TRANSPORTATION RESEARCH CENTER INC.

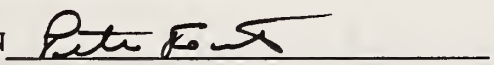
NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

HYBRID III 07-MAR-95

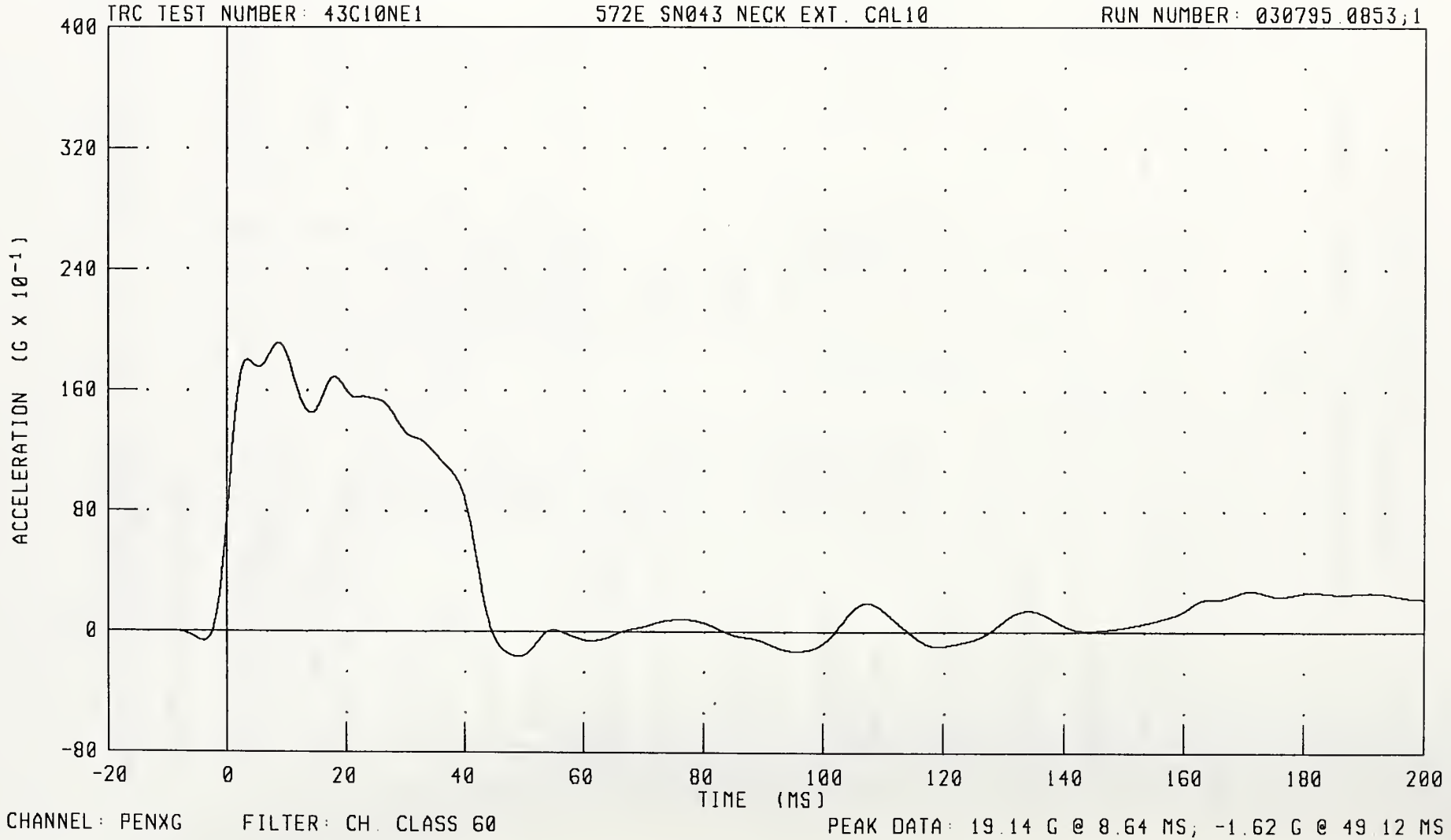
TRC INC. TEST NO: 43C10NE1 572E SN043 NECK EXT. CAL10

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	52.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.00 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.40 G
	20 MS	14.00 - 19.00 G	15.99 G
	30 MS	11.00 - 16.00 G	13.17 G
MAX PENDULUM G		22 G MAX	19.14 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.14 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	41.84 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	91.06 DEG.
	TIME	72 - 82 MS	76.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-60.04 NM
	TIME	65 - 79 MS	70.56 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	158.00 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	137.52 MS

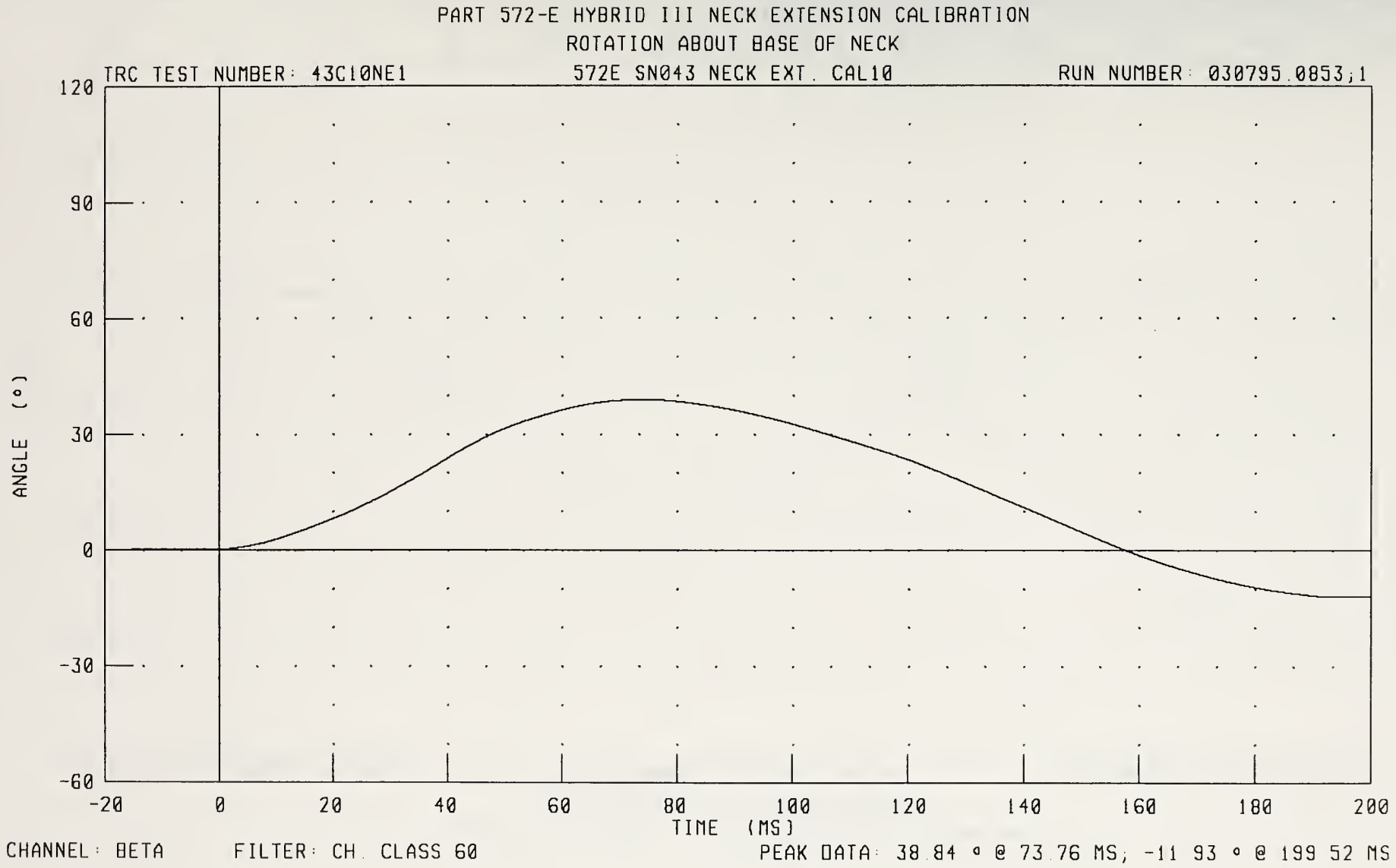
TEST MEETS SPECIFICATIONS

TECHNICIAN  RUN NUMBER: 030795.0852;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION

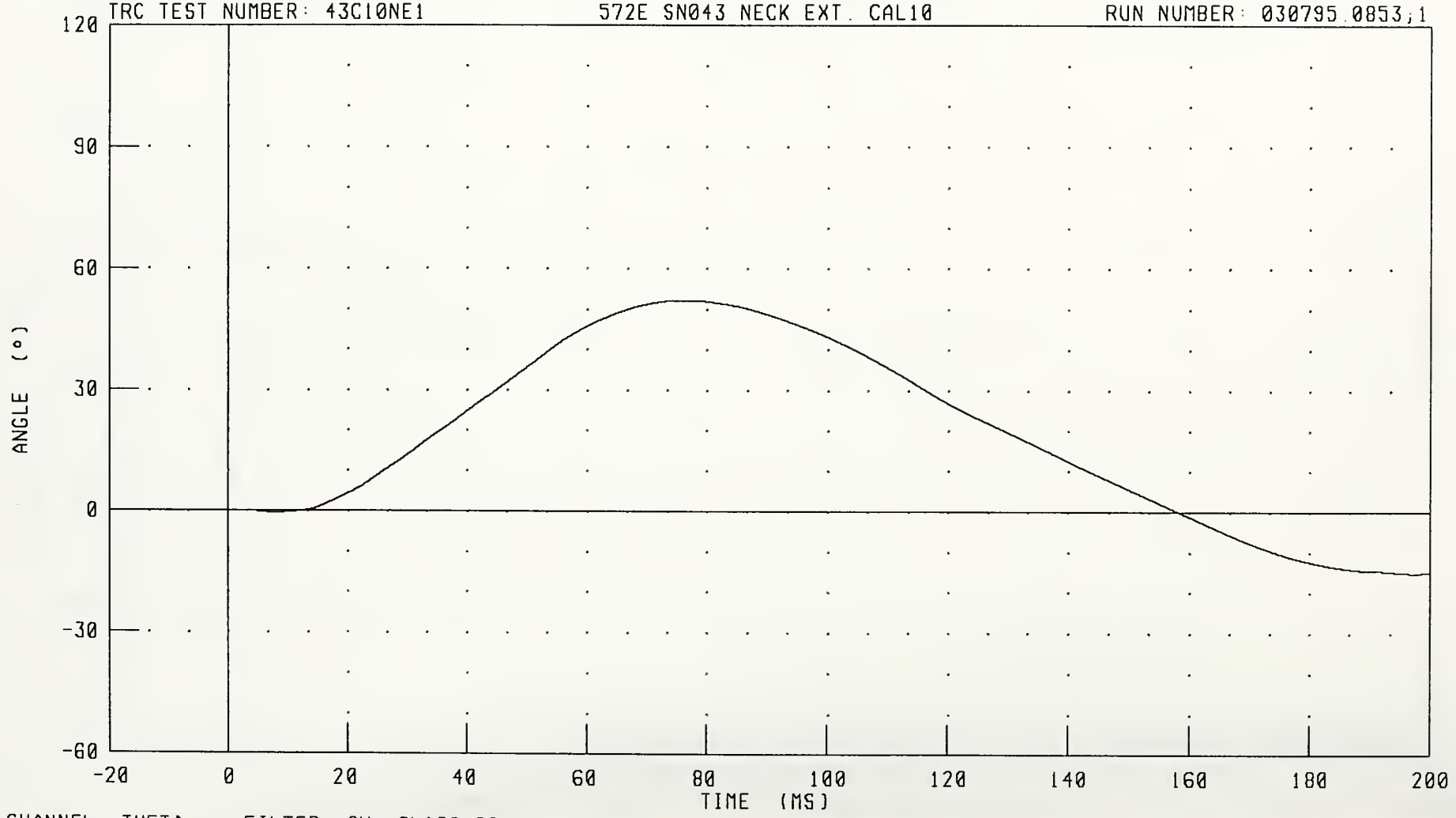


CHANNEL: PENXG FILTER: CH. CLASS 60 PEAK DATA: 19.14 G @ 8.64 MS; -1.62 G @ 49.12 MS

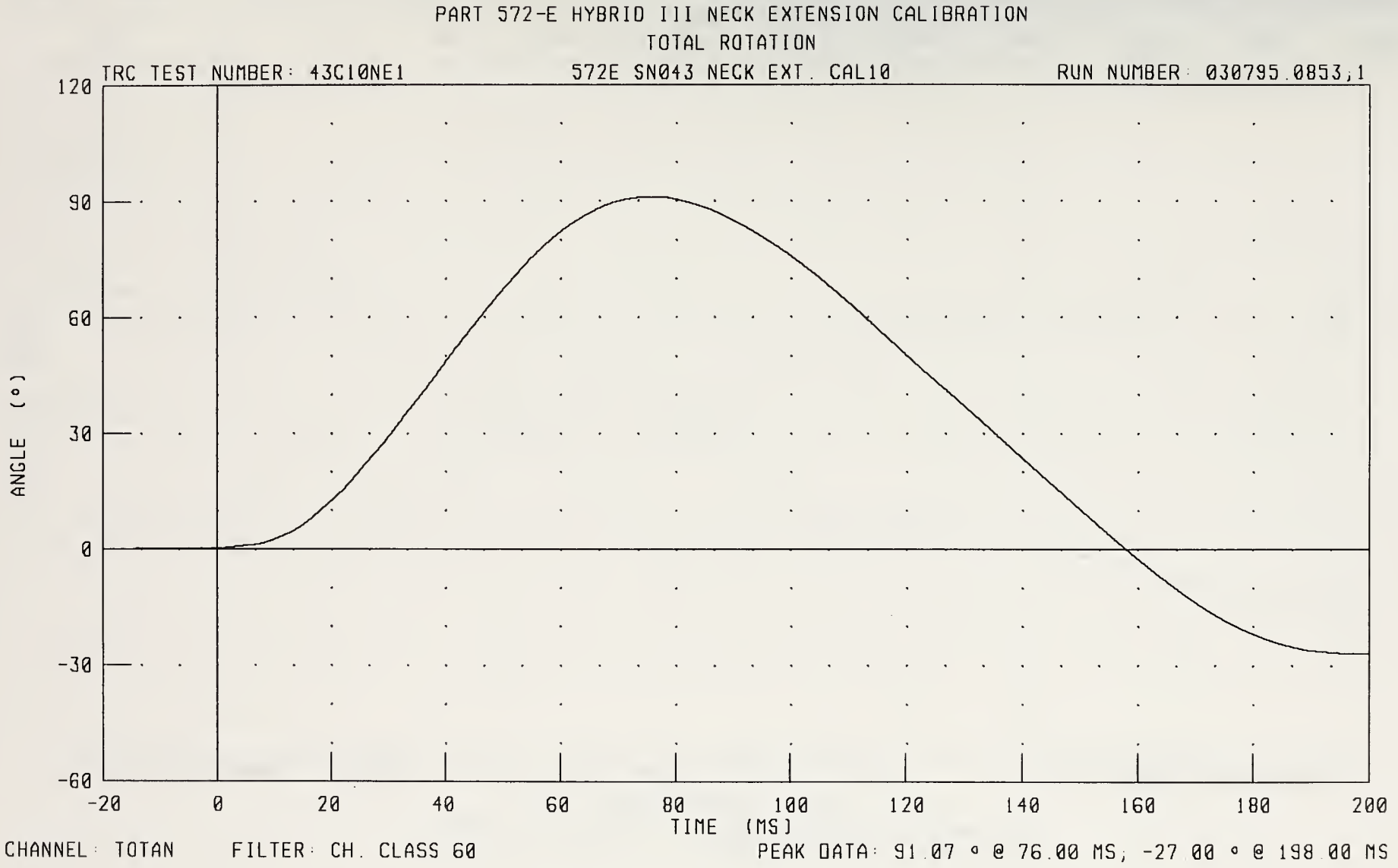

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK
TRC TEST NUMBER: 43C10NE1
572E SN043 NECK EXT. CAL10
RUN NUMBER: 030795.0853;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 38.84 ° @ 73.76 MS; -11.93 ° @ 199.52 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

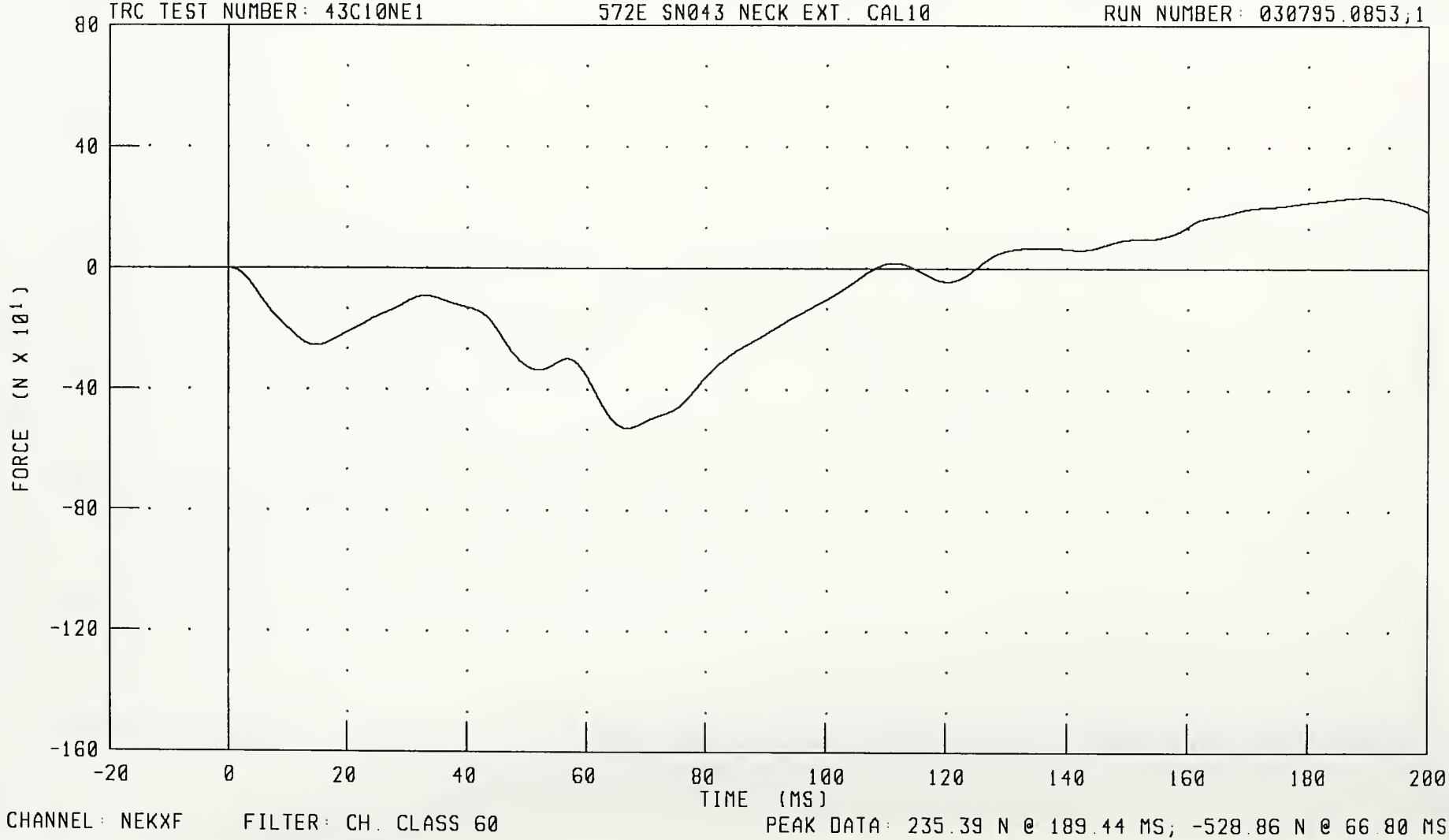
TRC TEST NUMBER: 43C10NE1 572E SN043 NECK EXT. CAL10 RUN NUMBER: 030795.0853;1



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 52.24 ° @ 76.32 MS; -15.10 ° @ 197.44 MS

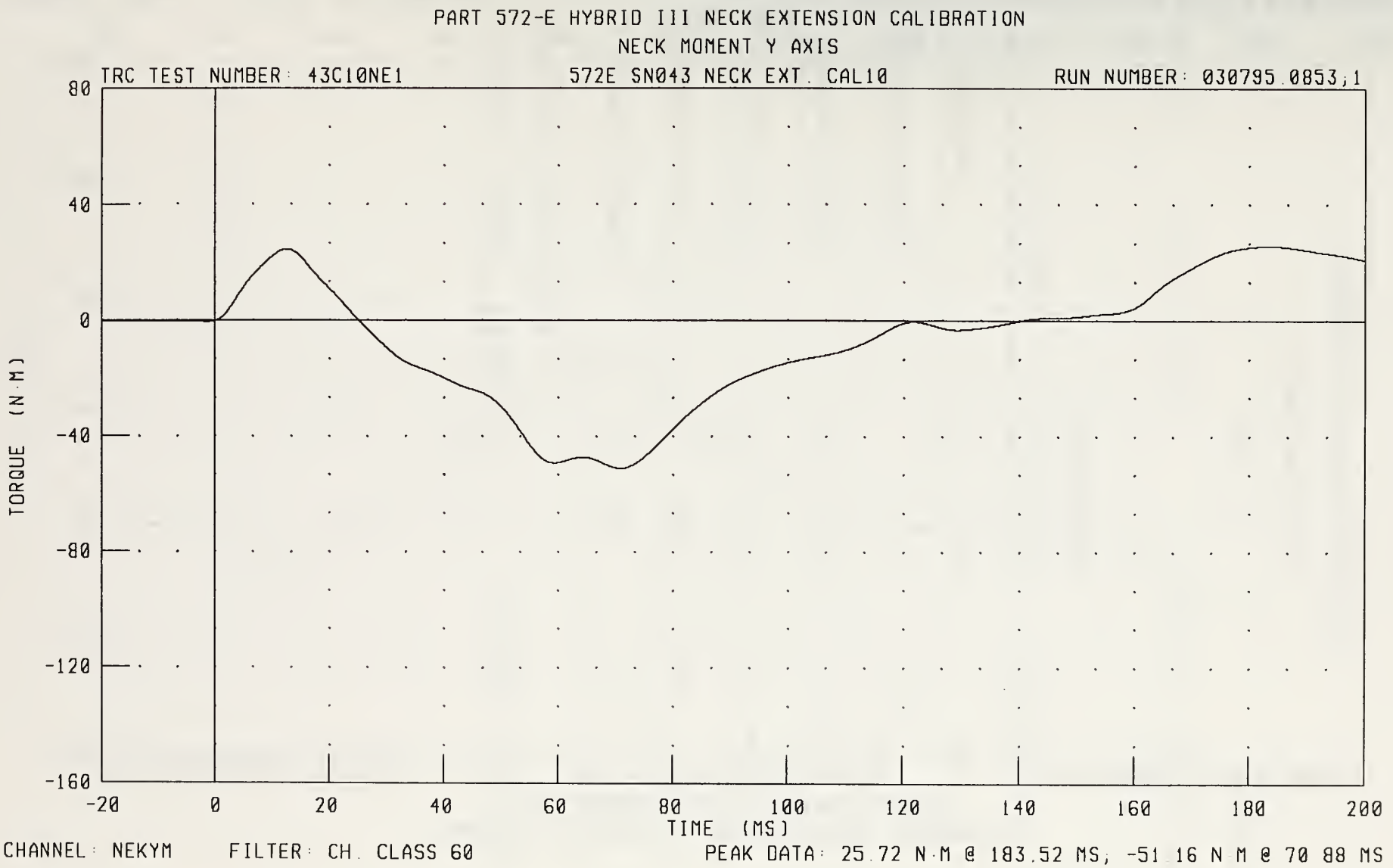

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL ROTATION
TRC TEST NUMBER: 43C10NE1
572E SN043 NECK EXT. CAL10
RUN NUMBER: 030795.0853;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: TOTAN
FILTER: CH. CLASS 60
PEAK DATA: 91.07 ° @ 76.00 MS; -27.00 ° @ 198.00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS

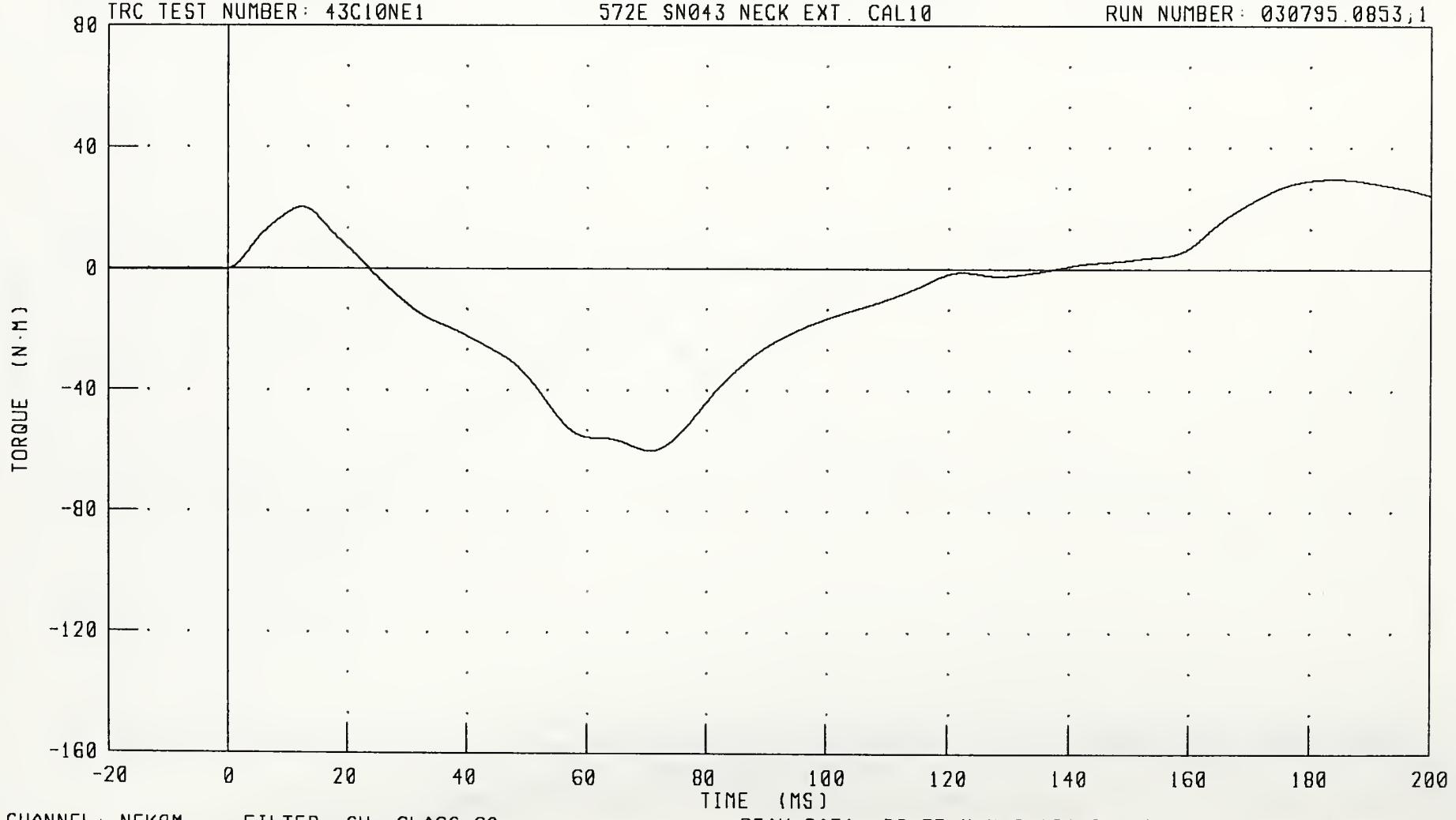


CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 235.39 N @ 189.44 MS; -528.86 N @ 66.80 MS


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 43C10NE1
572E SN043 NECK EXT. CAL10
RUN NUMBER: 030795.0853;1
80
40
0
-40
-80
-120
-160
TORQUE (N.M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 25.72 N.M @ 183.52 MS; -51.16 N.M @ 70.88 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 29.75 N-M @ 184.00 MS; -60.04 N-M @ 70.56 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

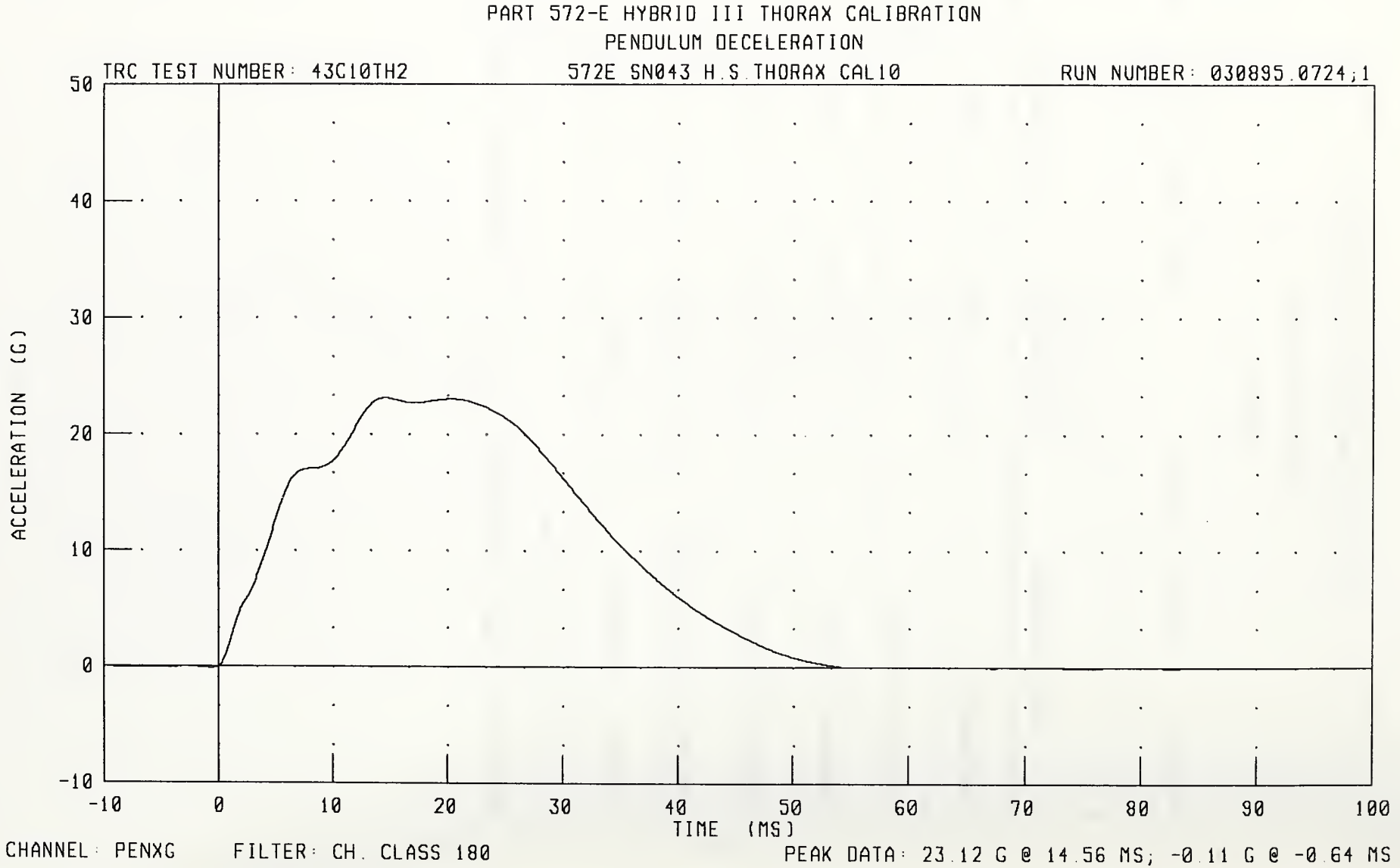
HYBRID III 08-MAR-95

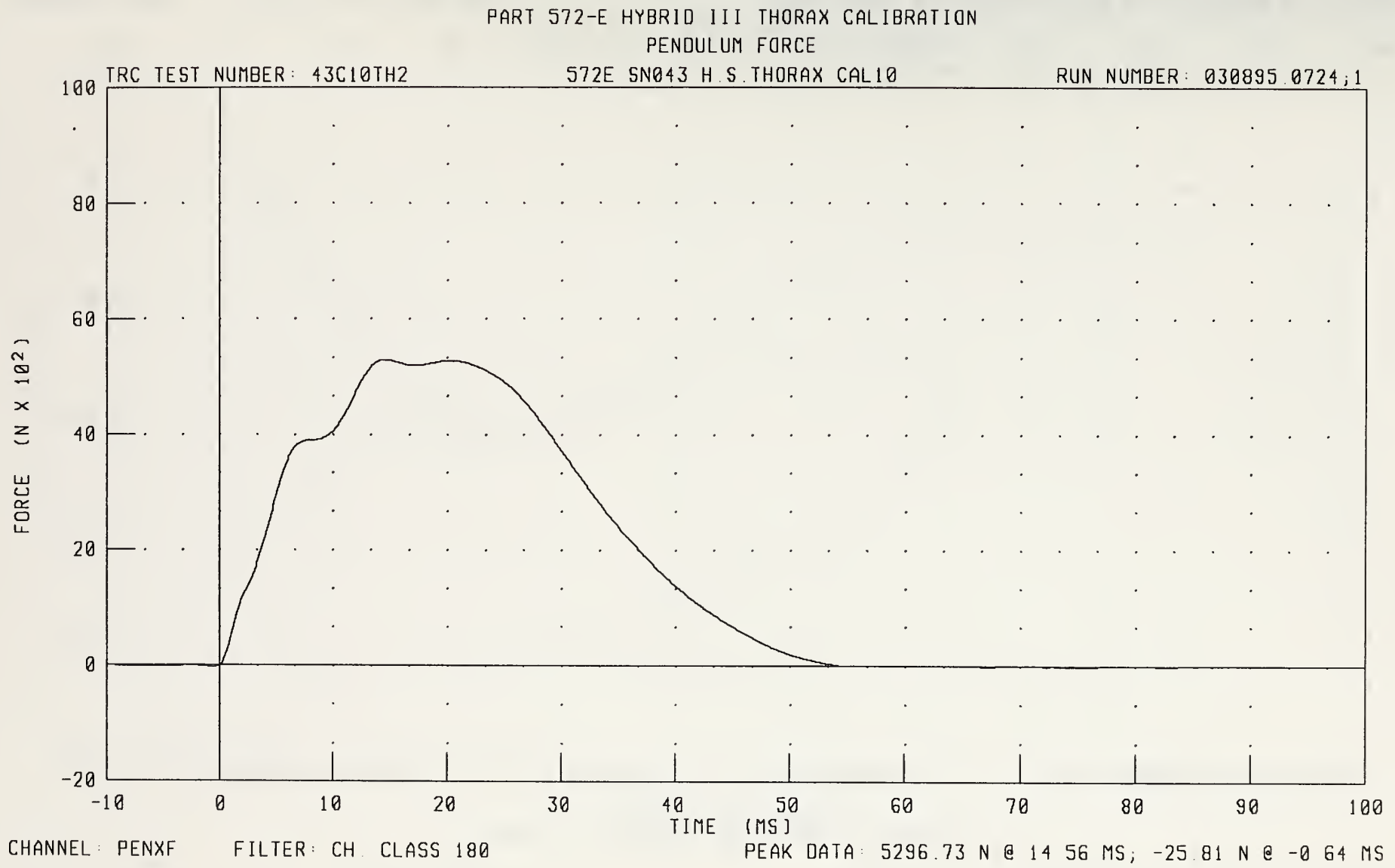
TRC INC. TEST NO: 43C10TH2 572E SN043 H.S.THORAX CAL10

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	40.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.68 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	64.1 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5296. N
INTERNAL HYSTERESIS	69% - 85%	75.4%

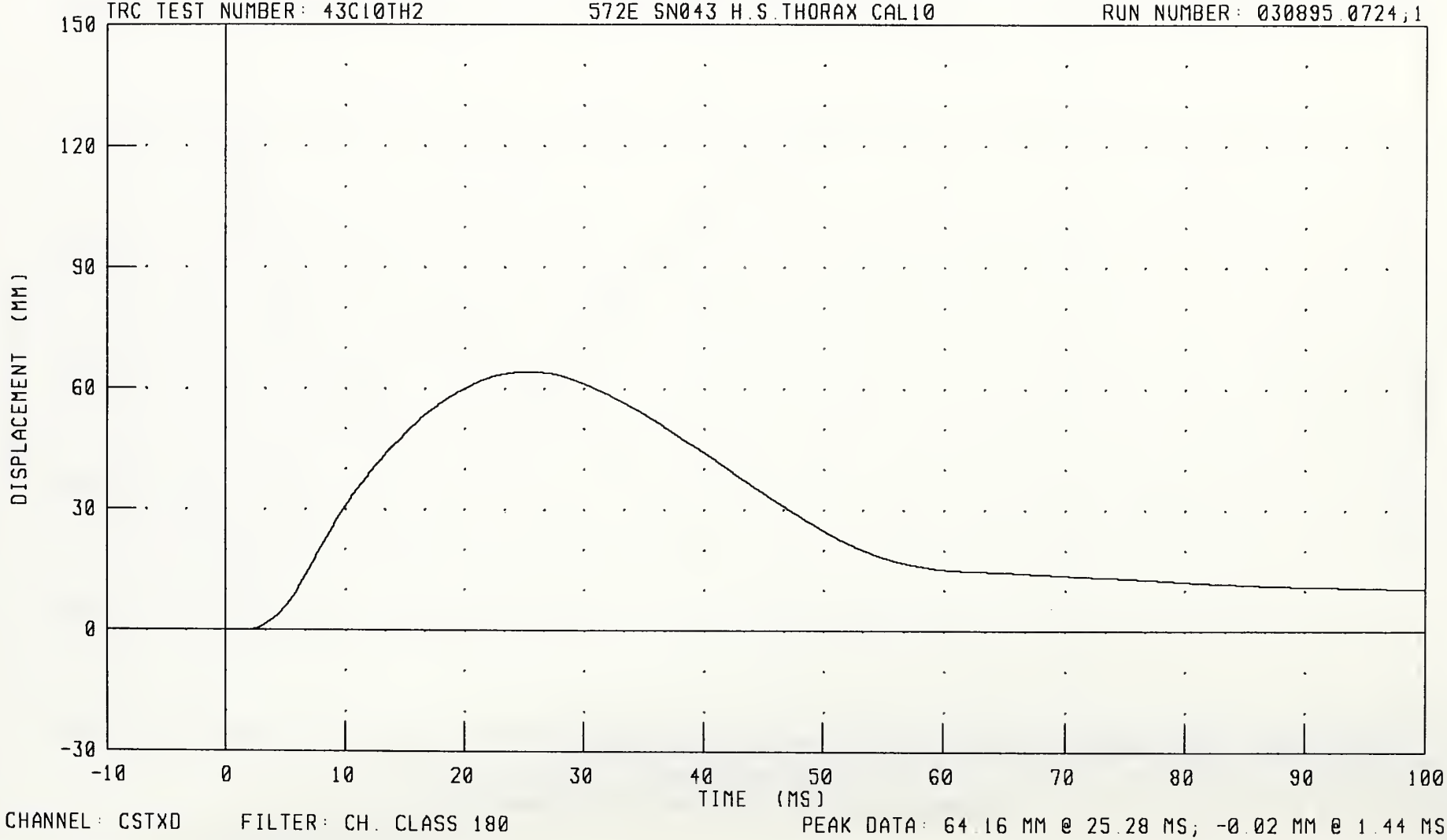
TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Fox RUN NUMBER: 030895.0723;1


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION
TRC TEST NUMBER: 43C10TH2
572E SN043 H.S.THORAX CAL10
RUN NUMBER: 030895.0724;1
ACCELERATION (G)
50
40
30
20
10
0
-10
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS)
CHANNEL: PENXG
FILTER: CH. CLASS 180
PEAK DATA: 23.12 G @ 14.56 MS; -0.11 G @ -0.64 MS


PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE
TRC TEST NUMBER: 43C10TH2
572E SN043 H.S.THORAX CAL10
RUN NUMBER: 030895.0724;1
100
80
60
40
20
0
-20
FORCE (N X 10²)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS)
CHANNEL: PENXF
FILTER: CH. CLASS 180
PEAK DATA: 5296.73 N @ 14.56 MS; -25.81 N @ -0.64 MS

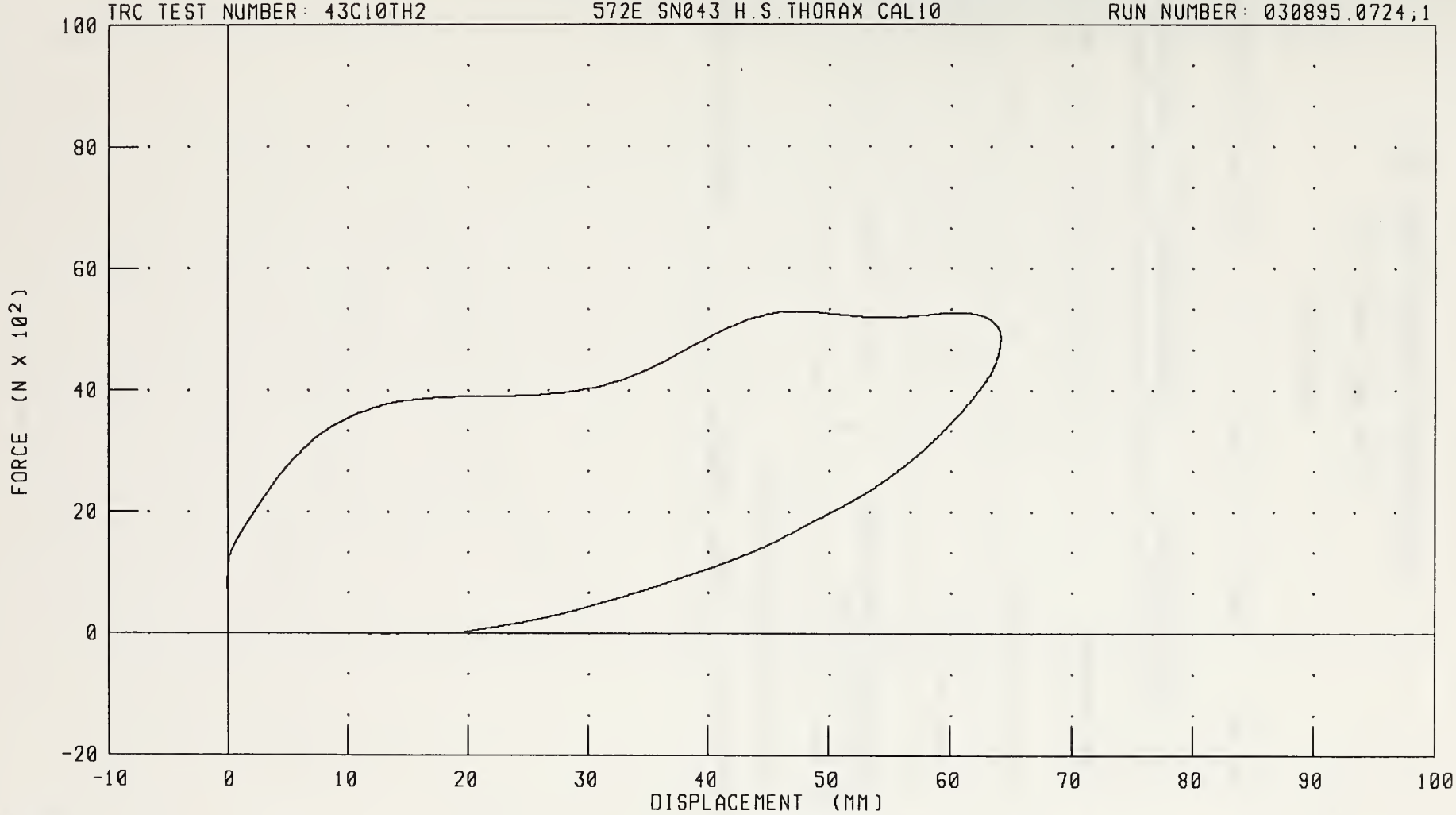
PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 64.16 MM @ 25.28 MS; -0.02 MM @ 1.44 MS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 43C10TH2 572E SN043 H.S.THORAX CAL10 RUN NUMBER: 030895.0724;1



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 64.16 MM @ 25.28 MS; -0.02 MM @ 1.44 MS
PENXF CH. CLASS 180 5296.73 N @ 14.56 MS; -25.81 N @ -0.64 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

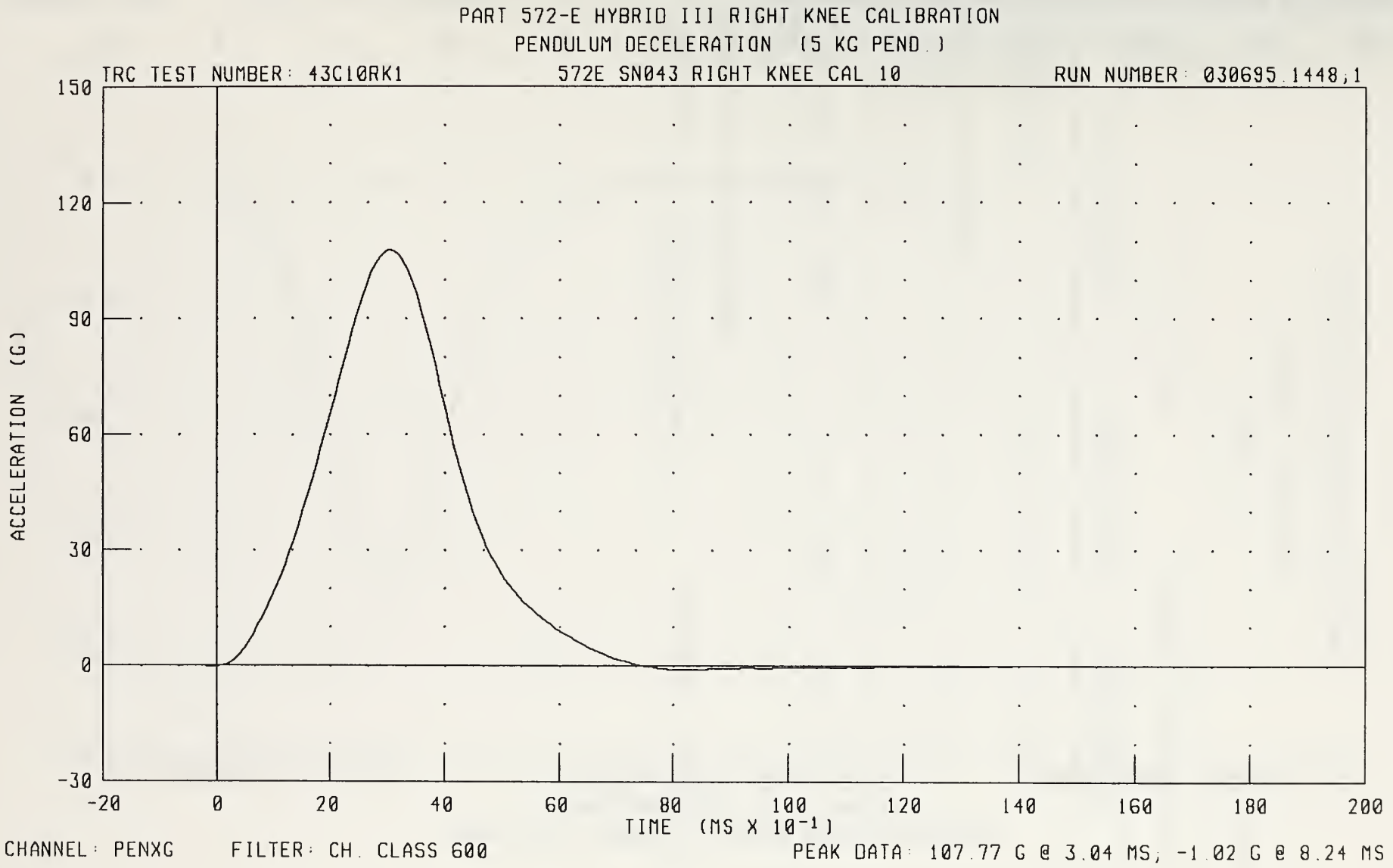
HYBRID III 06-MAR-95

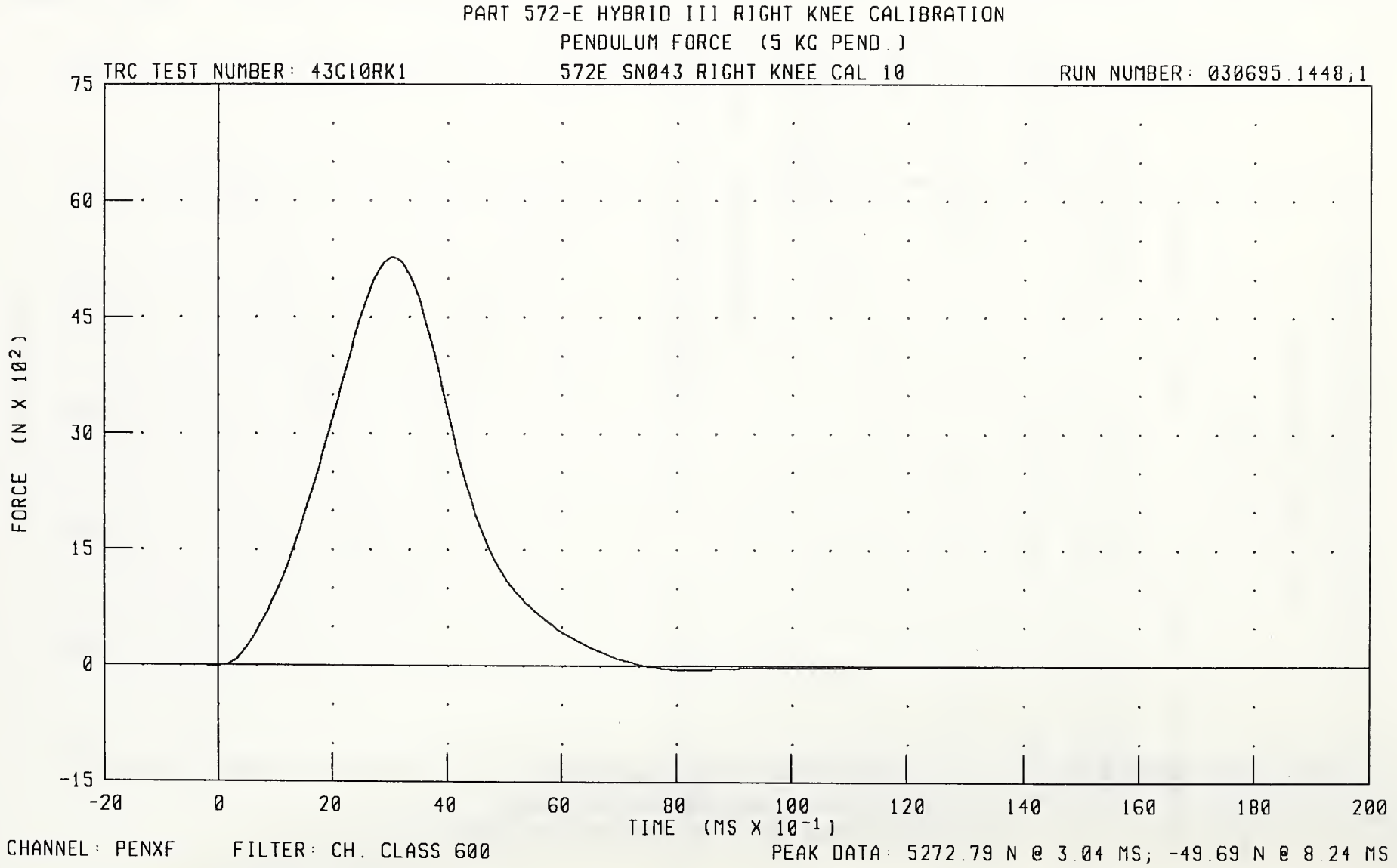
TRC INC. TEST NO: 43C10RK1 572E SN043 RIGHT KNEE CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	44.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5272.7 N

TEST MEETS SPECIFICATIONS

TECHNICIAN  RUN NUMBER: 030695.1447;1


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 43C10RK1
572E SN043 RIGHT KNEE CAL 10
RUN NUMBER: 030695.1448,1
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 107.77 G @ 3.04 MS; -1.02 G @ 8.24 MS


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 43C10RK1
572E SN043 RIGHT KNEE CAL 10
RUN NUMBER: 030695.1448;1
75
60
45
30
15
0
-15
FORCE (N X 10²)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 5272.79 N @ 3.04 MS; -49.69 N @ 8.24 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

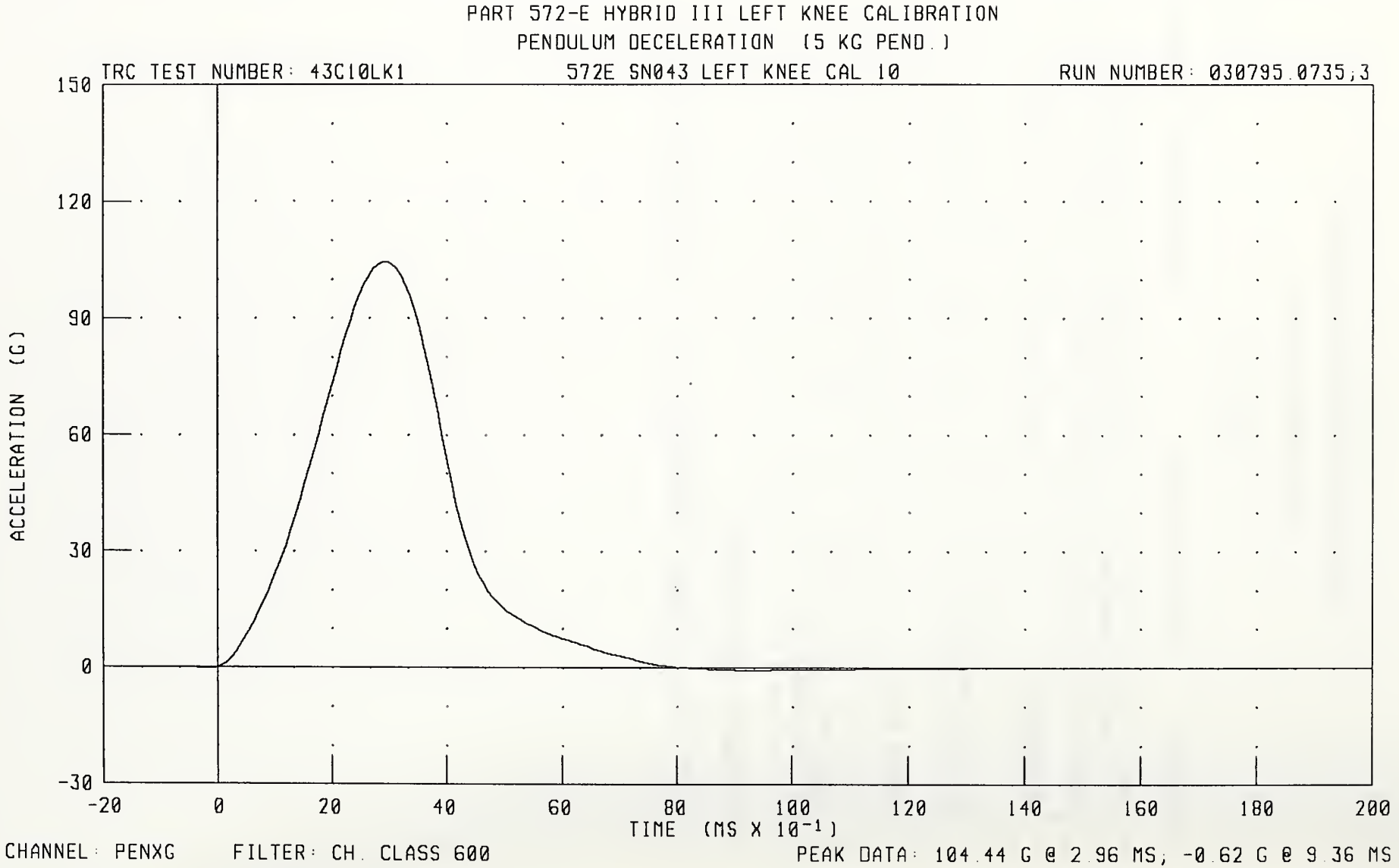
HYBRID III 07-MAR-95

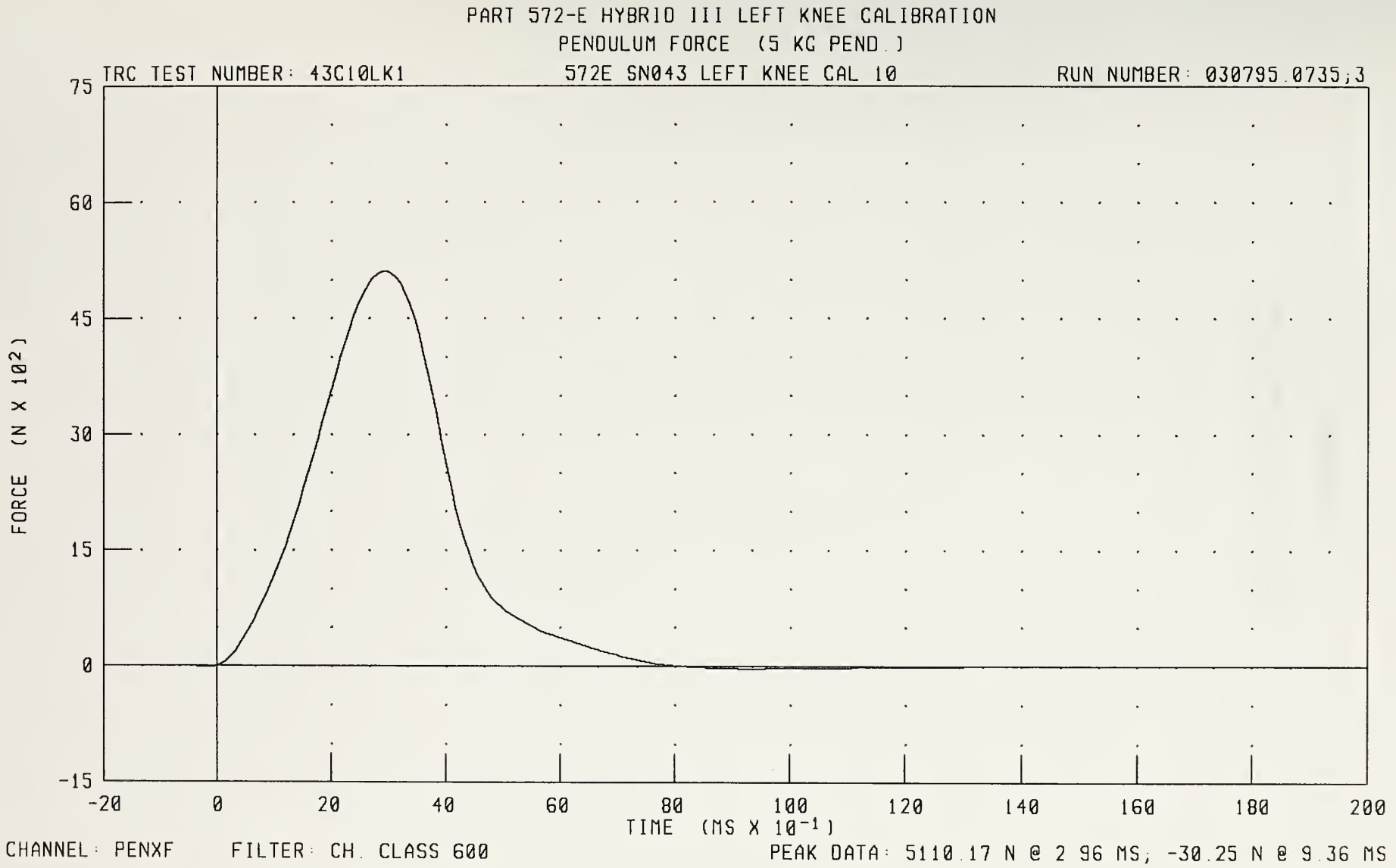
TRC INC. TEST NO: 43C10LK1 572E SN043 LEFT KNEE CAL 10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	52.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5110.1 N

TEST MEETS SPECIFICATIONS

TECHNICIAN Peter Foster RUN NUMBER: 030795.0732;3


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 43C10LK1
572E SN043 LEFT KNEE CAL 10
RUN NUMBER: 030795.0735;3
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 104.44 G @ 2.96 MS; -0.62 G @ 9.36 MS


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 43C10LK1
572E SN043 LEFT KNEE CAL 10
RUN NUMBER: 030795.0735;3
FORCE (N X 10²)
75
60
45
30
15
0
-15
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 5110.17 N @ 2.96 MS; -30.25 N @ 9.36 MS

Appendix D

Miscellaneous Test Information

Dummy Instrumentation Placement

Dummy Mfr. & S/N: Humanoid/043

Seating Position: Driver

Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
Head Acceleration	X	Endevco	7264	DC54J	Rear
Head Acceleration	Y	Endevco	7264	EY99J	Left
Head Acceleration	Z	Endevco	7264	EH75J	Up
Chest Acceleration	X	Endevco	7264	DC72J	Front
Chest Acceleration	Y	Endevco	7264	BC26J	Left
Chest Acceleration	Z	Endevco	7264	DG50J	Up
Chest Deflection	X	Servo	14CB1-2897	CP043	Outward
Pelvis Acceleration	X	Endevco	7264	BF42J	Rear
Pelvis Acceleration	Y	Endevco	7264	FJ66J	Left
Pelvis Acceleration	Z	Endevco	7264	DG56J	Up
Left Femur Force		GSE	2435	739	Tension
Right Femur Force		GSE	2430	741	Tension

Vehicle Instrumentation Information

Test No. 950314

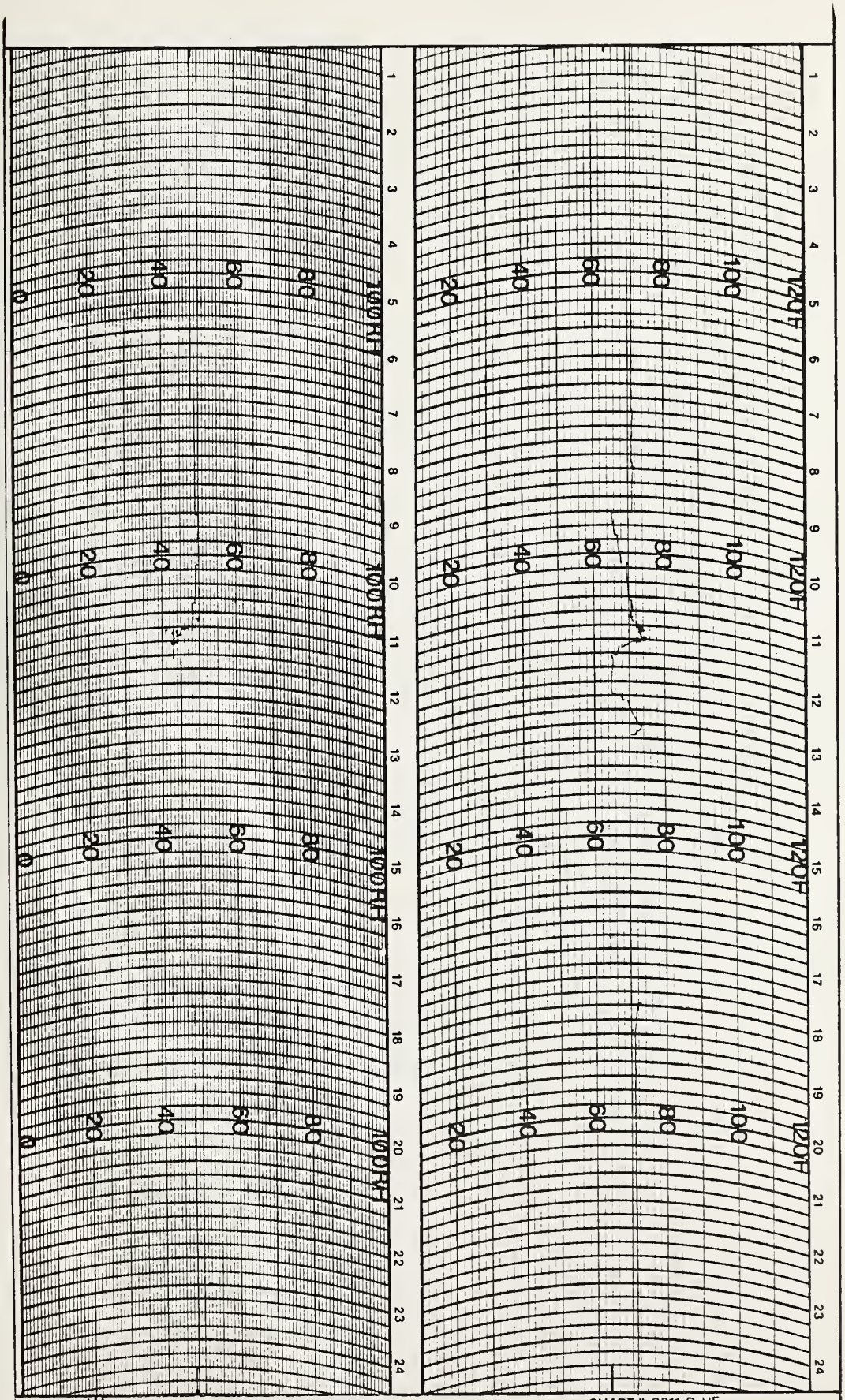
No.	Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
1	Left Rear Seat Crossmember					
	Longitudinal	X	Endevco	7264	BF04	Front
	Lateral	Y	Endevco	7264	BH91J	Right
2	Right Rear Seat Crossmember					
	Longitudinal	X	Endevco	7264	AS95	Rear
	Lateral	Y	Endevco	7264	AT38	Left
3	Engine Top Longitudinal	X	Endevco	7264	AW52	Front
4	Engine Bottom Longitudinal	X	Endevco	7264	AP87	Rear
5	Instrument Panel Center					
	Longitudinal	X	Endevco	7264	AN45	Front
6	Vehicle Center of Gravity					
	Longitudinal	X	Endevco	7264	AY66	Front
	Lateral	Y	Endevco	7264	AZ67	Left
	Vertical	Z	Endevco	7264	AU31	Up
	Lap Belt Outboard Force		Lebow	3419	127	Tension
	Shoulder Belt Outboard Force		Lebow	3419	612	Tension

Heavy Truck Instrumentation Information

No.	Location	Axis	Mfr.	Model	S/N	Orientation (+ Sensing)
9	Front Frame Crossmember					
	Longitudinal	X	Endevco	7264	AK21	Rear
	Lateral	Y	Endevco	7264	BE97J	Left
	Vertical	Z	Endevco	7264	BC75J	Up
10	Center of Gravity					
	Longitudinal	X	Endevco	7264	AG24	Front
	Lateral	Y	Endevco	7264	BA46	Left
	Vertical	Z	Endevco	7264	BF99J	Up

Sign Convention
NHTSA Data Tape Reference Guide

Accelerometers:	+X: Forward	
	+Y: Leftward	
	+Z: Upward	
Potentiometers:	+Chest Longitudinal Deflection:	outward
	+Chest Lateral Deflection:	leftward
	+Seat Belt Displacement:	outward
	+Seat Belt Extension:	elongation
	+Knee Slider Displacement:	distance between femur and tibia increased (in relation to a seated dummy)
Load Cells:	+Femur Force:	tension
	+Seat Belt Force:	tension
	+Barrier Force:	tension
Neck Load Cells:	+X Force:	head pushed forward
	+Y Force:	head pushed leftward
	+Z Force:	head pulled upward (tension on neck)
	+X Moment:	right ear rotating toward right shoulder
	+Y Moment:	chin rotating toward chest
	+Z Moment:	chin rotating toward left shoulder
Tibia Load Cells:	+X Force:	tension
	+Y Force:	tension
	+Z Force:	tension
	+X Moment:	bottom of tibia moving leftward
	+Y Moment:	bottom of tibia moving rearward



Occupant Compartment Thermograph